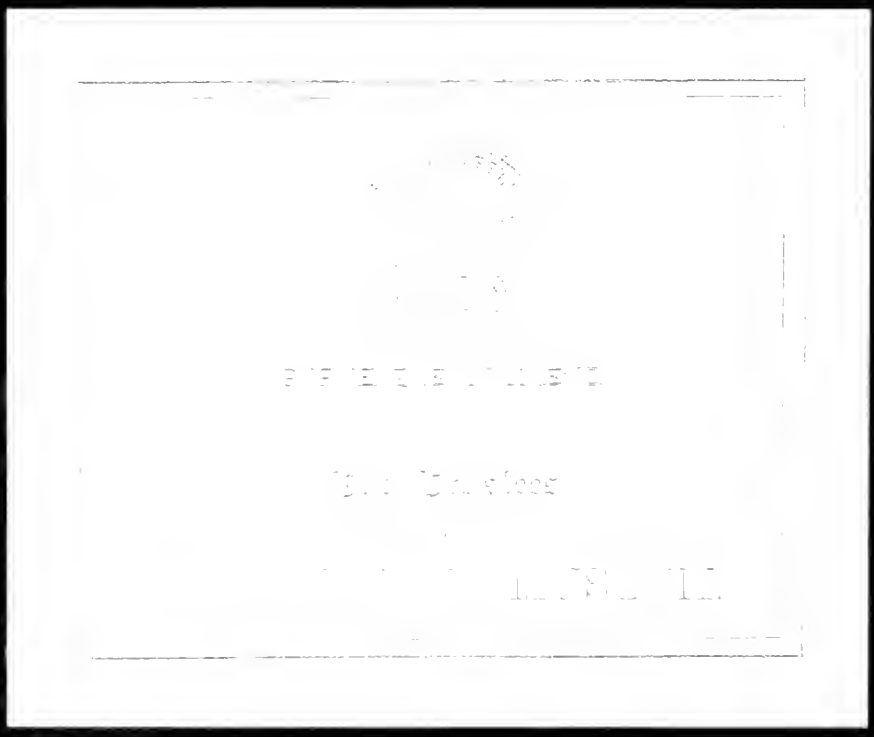

ILLUSTRATIONS OF

BRITISH BLOOD-SUCKING FLIES

WITH NOTES BY

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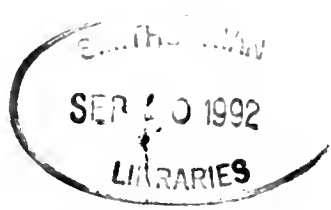


PREFACE.

THE coloured drawings from which the plates in this book are reproduced have been prepared for exhibition in the North Hall of this Museum.

Before devoting them, however, to the purpose for which they were primarily intended, it was thought that if published in a convenient form their sphere of usefulness would be increased, while an opportunity would also be afforded for the inclusion of fuller notes on each species than can be given in a label.

For exhibition purposes, and to facilitate the recognition and comparison of the different species, the drawings have been made on a greatly enlarged scale, to which it has not in all cases been possible to adhere in the reproductions; but wherever practicable the copies are of the same size as the originals.

Many of the species here illustrated have an extremely wide distribution, so that the book may perhaps be of service to naturalists outside the British Islands; while the illustrations, either as representing species or simply as types of genera, will doubtless be useful to those engaged in the study of Blood-Sucking Flies in connection with disease.

E. RAY LANKESTER.

BRITISH MUSEUM NATURAL HISTORY,
CROMWELL ROAD, LONDON, S.W.

March 24th, 1906.

LIST OF PLATES.*

CHIRONOMIDÆ.

Midges.

CULICIDÆ.

Gnats or Mosquitoes.

SIMULIDÆ.

TABANIDÆ.

Horse-flies.

* Except where otherwise stated, the female alone is illustrated. The crossed lines on the plates indicate the natural size of the insects.

MUSCIDÆ.

HIPPOBOSCIDÆ.

INTRODUCTION.

THE British entomologist desirous of obtaining coloured illustrations of his country's insect fauna finds that, as regards the more popular Orders, such as the butterflies and moths, or the beetles, ample provision has been made for his wants. Should his predilections, however, incline towards Flies (Diptera), the case is altogether different. For, with the exception of the excellent coloured figures of certain British Diptera contained in Vol. VIII. of Curtis's 'British Entomology' (many of which were published more than eighty years ago), and three plates of equally excellent coloured figures included in Miss Staveley's 'British Insects' (London: L. Reeve and Co., 1871), no illustrations of British Flies in colour are obtainable. It is hoped that the plates in the present work, which faithfully depict the natural colours, and many of the external structural characters of some of the most interesting and important of British Diptera, may do something towards meeting the deficiency.

Although under the social conditions of modern life Blood-Sucking Flies are less troublesome to human beings in the British Islands than in some other less highly civilised countries, many of the species illustrated in this book still often contrive to make their presence inconveniently felt, while others in country districts are regular tormentors of cattle and horses during the summer months. Within the last few years Blood-Sucking Flies have acquired a new importance, in view of modern discoveries as to the causation and dissemination of certain diseases of man and animals, and although no Blood-Sucking Fly is permanently associated with any disease in the British Islands at the present day, the British mosquitoes of the genus *Anopheles* remind us of the time, still comparatively recent, when ague was rife in England, while *Stomoxys calcitrans* recalls the Tsetse-flies of Tropical Africa, and the part played by them in sleeping sickness and nagana.

In the following pages no attempt has been made to supply a detailed technical description of each species illustrated in the plates. In the case of the majority of the species, at any rate, it is believed that the plates will render such descriptions unnecessary, and, apart from this, the many demands upon the author's official time would have made their preparation impossible. The same reason, coupled with limitations of space, has also unfortunately necessitated the omission of a considerable amount of matter relating to the life-history of the species mentioned, but brief notes on life-history are included in the remarks upon each family. Since it was thought that British readers might be interested to learn in what other countries our native Blood-Sucking Flies are found, the geographical distribution of each species so far as it is known has in all cases been stated. References to original descriptions of genera and species, and discussions of synonymy, though necessarily included in a monograph, have here been omitted as out of place in a work which does not profess to be more than a popular account of the insects of which it treats. Since the primary object of this book is to facilitate by means of the plates the identification of *Blood-Sucking* Flies, the males that (probably with the exception of those of species belonging to the Muscidæ and Hippoboscidæ) do not suck blood have not, as a rule, been illustrated.

The original water-colour drawings of the species represented have been prepared by Mr. A. J. Engel Terzi with his usual care and exceptional skill, and a word of acknowledgment is also due to Mr. Harry F. Witherby (of Messrs. Witherby and Co.), who has personally supervised their reproduction, and has been unremitting in his endeavours to produce thoroughly satisfactory copies of the artist's beautiful work. A special feature deserving of note in connection with the illustrations is the use of *permanent* paper for the plates, instead of the perishable coated paper generally employed for three-colour work. The change has greatly increased the difficulties of reproduction, but it is hoped that it will be appreciated by purchasers of the book.

Field notes on many of the species illustrated and mentioned in the text have been kindly contributed by Lieut.-Colonel J. W.

Yerbury, an enthusiastic collector and student of Diptera, to whose generosity the Museum is largely indebted for its modern collection of British Flies.

ERNEST E. AUSTEN.

British Museum (Natural History),
London, S.W.

March 21st, 1906.

BRITISH

BLOOD-SUCKING FLIES.

IN the shape of the common house-fly, or the blue-bottle, Flies are familiar to everyone, and a brief examination of either of these household pests will reveal two of the chief characteristics of the Order (DIPTERA) to which they belong,—the possession of but a *single pair of wings*, and, immediately behind these, the presence of a pair of little knobbed organs, the *halteres* or balancers, which represent the second pair of wings possessed by other insects. These two features,—the single pair of wings and the halteres, both of which can clearly be seen in the majority of the plates illustrating the present work,—serve to distinguish all ordinary Diptera from all other insects. The winged males of Coccidæ (Scale-insects), which belong to the Order Rhynchota, though they have only one pair of wings, and might perhaps be mistaken for gall-midges (Diptera), are distinguished by the possession of a pair of long caudal filaments at the tip of the abdomen, and by being without halteres. In a small number of aberrant Diptera, as in the sheep "tick" (Plate 34), the wings, or both wings and halteres, are entirely wanting, but in these cases the other details of the insect's external anatomy disclose its systematic position. Under the term "Flies" we include then, not only the horse-flies (Tabanidæ) and many other families, the species of which more or less resemble the house-fly in shape, but also the midges and mosquitoes, which, though very dissimilar from the former in appearance, nevertheless possess all the essential structural characters of Diptera.

Excluding the Fleas (Pulicidæ), which it is better to regard as forming a separate Order of insects, 59 families are recognised in Verrall's 'List of British Diptera,' 2nd Edition, Cambridge, 1901. Of these, if we leave out of the question the highly specialised and

extremely aberrant Nycteribidæ, which, doubtless, suck blood, but, being exclusively parasitic on bats, are of no practical importance, the blood-sucking habit is met with in only eight. Included in this total are the Psychodidæ and Leptidæ; as regards the former, the blood-sucking genus *Phlebotomus* does not occur in Great Britain, and although blood has been noticed (by the Rev. A. E. Eaton) in the abdomen of a British specimen of *Sycorax silacea*, Hal., the insect has not yet been observed in the act of sucking blood, so that for our present purpose the Psychodidæ may be left out of account. The same course may be taken in the case of the Leptidæ, for no species of this family has yet been recorded as sucking blood in the British Islands, although in France the common British *Leptis scolopacea*, Linn. (as also *L. strigosa*, Mg.—a "reputed" British species) has been observed in the act of doing so on two or three occasions. The number of families of British Diptera that include blood-sucking species is therefore reduced to six,—the Chironomidæ (midges), Culicidæ (gnats or mosquitoes), Simulidæ, Tabanidæ (horse-flies), Muscidæ, and Hippoboscidæ. In two of these, the Chironomidæ and Muscidæ, the blood-sucking habit is exceptional and confined to a few species; in the remainder, with the exception of a few small genera of Culicidæ, the species of which do not suck blood, it is universal in the female sex, to which, with the exception of the Muscidæ (and possibly of the Hippoboscidæ), the habit is restricted. It should be noted that most, if not all, mosquitoes are also capable of subsisting upon the juices of plants.

The number of species of blood-sucking flies that occur in the British Islands cannot be stated precisely, since the total of the blood-sucking species of midges (genus *Ceratopogon, sens. lat.*) and that of our indigenous species of *Simulium* is at present entirely uncertain. If, however, we count each of these groups as numbering a dozen species (certainly not an extravagant estimate), and include the two species of Nycteribidæ, the number of British species of blood-sucking flies would amount to 74. The total number of species of Diptera recognised as British at the present time may be taken as between 2700 and 3000.

With these introductory remarks we may proceed to a consideration of the species illustrated in the plates, which represent the principal British blood-sucking flies.

Family

CHIRONOMIDÆ

Midges.

Although these insects are by far the smallest of all blood-sucking flies, the pertinacity and blood-thirstiness of some species of midges is such that, in the British Islands at any rate, they cause much more discomfort and annoyance to human beings than the species of any other family mentioned in this book; and, during the spring and summer months, in the evening hours when they are most active, their presence often constitutes a serious drawback to life in the country. Occasionally midges occur locally in such numbers as to amount to a veritable plague. With reference to a species, at present undetermined, which abounds in Scotland, Colonel Yerbury writes: "This insect is a great pest in the Highlands; it collects in large numbers on one's knickerbocker stockings, and the bites cause the skin to look as if covered with a severe rash." It should be pointed out that the majority of the species of midges are perfectly harmless. The British blood-sucking forms belong to the genus *Ceratopogon* (*sens. lat.*), which is distributed throughout the world, and of which we have some fifty indigenous species. Only a few of these, however, are known to suck blood, and the habit is confined to the female sex. As in the gnats or mosquitoes (Culicidæ), the wings when at rest are carried flat, closed one over the other like the blades of a pair of scissors; in many species (as in the two selected for illustration) they are minutely hairy, and they are often speckled with greyish brown blotches. The sexes can be distinguished owing to the possession by the males of tufted antennæ and a more elongated shape. As a general rule the larvæ of naked-winged species of *Ceratopogon* are aquatic, those of hairy-winged species terrestrial. The eggs of aquatic species are laid in floating algæ, in star-shaped clusters containing from one hundred to one hundred and fifty. The larvæ of these species are whitish worm-like creatures, with long narrow heads; they live in the masses of Confervæ floating on the surface of stagnant pools and ditches, and progress with a serpentine motion. The larvæ of the hairy-winged

species live under the damp bark of dead trees, in weeping spots on tree trunks, and in decaying vegetable matter generally, such as manure, rotting fungi, &c. These terrestrial larvæ are usually shorter than the aquatic ones, and do not move in serpentine fashion.

The precise number of species of British blood-sucking midges has yet to be determined; the two figured on Plate I are among the most common.

Genus

CERATOPOGON, Meigen.*

Ceratopogon varius, Winn.

Plate I, fig. 1.

This exceedingly minute fly, the female of which measures only $1\frac{1}{4}$ mm. in length, is, within the personal experience of the writer, a vigorous blood-sucker, and, when it is engaged in operations on the back of one's hand, its tiny abdomen can be seen increasing in size and turning pink as the blood is pumped into it. Blood-sucking midges are seldom collected, and the Museum series of this species is insufficient to throw much light on its seasonal or local occurrence in the British Islands; but there are specimens from Newmarket Cambridgeshire, May 5th; and Frant, Sussex, June 16th, 1886 (*G. H. Verrall*); and from Kingsbury, Middlesex, June 14th, 1891 (*E. E. Austen*).

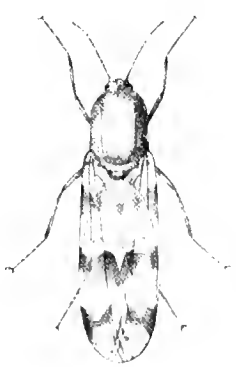
The geographical range of this species includes Northern and Central Europe.

* Some few years ago Latreille's genus *Culicoides* was revived by Kieffer (Bull. de la Soc. d'Hist. Nat. de Metz, 21ème Cahier (Metz: 1901), p. 143) for the group of species which includes *Ceratopogon varius*, Winn., & *C. pulicaris*, Linn. The author in question also introduced three other genera at the expense of the old genus *Ceratopogon*, which, owing to the large number of species comprised in it, was in urgent need of division. For the purposes of the present work, however, it has been thought unnecessary to change the nomenclature adopted in Verrall's 'List,' 2nd Ed. (1901).

Ceratopogon pulicaris, Linn.

Plate 1, fig. 2.

In certain localities in England in the latter part of April and beginning of May, 1904, this midge was especially abundant, and much inconvenience was caused by its bites. A correspondent writing from Romford, Essex, on April 28th, with reference to the multitudes of *Ceratopogon pulicaris* with which the town was then afflicted, said :—" They swarm in countless myriads, and their bite is very virulent, to me worse than a bee-sting, or the bite of any gnat. I have never seen them before in anything like the quantities, neither have I known the effects to be so severe and lasting. No doubt the hot sun and damp soil have brought them out, as in the tundras." Writing again on May 1st, the same correspondent said :—" The insects were in such large numbers that by just turning a killing-bottle through the air I soon got a pill box full. Many of my



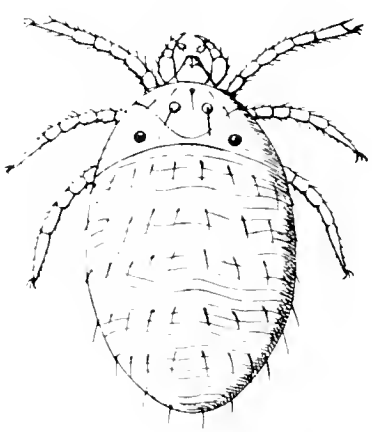
Ceratopogon pulicaris, Linn. (♀), in resting position (× 12).

neighbours had lumps on their necks, and their faces like measles, while some of the workmen 'struck.'" In many other localities near London, such as Epping Forest, Harrow, and the suburb of Stoke Newington, this pest was also very prevalent at the same time, and in

consequence of their attacks, people found it impossible to remain in gardens after 5 p.m.

Ceratopogon pulicaris measures 2 mm. in length, and is therefore considerably larger than *C. varius*; it abounds throughout Europe, and can easily be recognised by the marking of the wings, which when closed appear to have transverse bands.

Note.



The Harvest Bug (*Leptus autumnalis*, Shaw). × 100. (After Mégnin.)

The irritating swellings caused by Harvest Bugs are occasionally mistaken for the bites of midges or gnats. The Harvest "Bug" (*Leptus autumnalis*, Shaw) is really a Mite, a minute Acarus,—the six-legged larva of a species of *Trombidium*: it is possible that larvæ belonging to more than one species are included under the same name. The annoyance is caused by these young forms *burrowing* into the skin, generally about the ankles and knees. Midges and gnats more usually attack the exposed parts of the body, although the females of both families readily bite through thin clothing.

Family

CULICIDÆ.

Gnats or Mosquitoes.

In view of the large amount of popular misconception that appears still to exist with reference to the meaning of the terms "gnat" and "mosquito," it may be worth while once again to emphasise the fact that, properly used, they apply to any species of the family Culicidæ, so that, if we prefer to employ a word of foreign origin rather than the Old English *gnat*, our British species of *Anopheles*, *Culex*, etc., are as much entitled to be called *mosquitoes* as are tropical species belonging to the same genera, from many of which they would be indistinguishable to the untrained observer.

Including certain non-blood-sucking forms belonging to the genera *Corethra*, *Mochlonyx*, and *Aëdes*, the species of mosquitoes now recognised as British are twenty-two in number. Many harmless midges belonging to the genera *Chironomus* and *Tanypus* resemble gnats more or less closely in outward appearance, but, apart from other structural characters, may be distinguished by the absence of the long, piercing proboscis, as also by the habit of holding up the front legs when at rest, whereas a gnat in the same position elevates its hind legs. In British, as in all mosquitoes with possibly one or two exceptions, the blood-sucking habit is confined to the female sex. The males may be distinguished by their plumed antennæ, and in the genera *Theobaldia*, *Culex*, and *Grabhamia* by their elongate palpi. In *Anopheles* the palpi are as long as the proboscis in both sexes, but in the male their tips are thickened, bent outwards, and somewhat plumose.

The preliminary stages of all mosquitoes are passed in water. The wriggling larvæ and comma-shaped pupæ of the common gnat (*Culex pipiens*, Linn.—Plate 8), which are familiar objects in cisterns and rain-water butts in summer, may be taken as types of those of the species belonging to the genera *Theobaldia*, *Culex*, and *Grabhamia*. In the case of the latter genus the eggs are usually laid singly. The eggs of the species belonging to the two former genera somewhat

resemble tiny "Indian clubs" in shape, and are deposited on the surface of the water, arranged vertically in compact masses, or "rafts," each containing from 200 to 300 eggs. The eggs of the species of *Anopheles*, on the other hand, are boat-shaped, and are not attached to one another, but float freely on the surface of the water in clusters of from two or three to as many as 100. The larvæ of the Culicinæ are distinguished by the possession of a posterior dorsal breathing tube, or respiratory siphon, which is absent in the Anophelinæ. When taking in air, the former suspend themselves at an angle from the surface film by the extremity of the respiratory siphon, but the larvæ of the latter lie perfectly horizontal. The food of mosquito larvæ consists of algæ and minute organisms, both animal and vegetable; in captivity they sometimes display cannibal propensities.

In addition to the species illustrated in the plates, the following blood-sucking mosquitoes are also found in the British Islands:—*Culex morsitans*, Theob., *lateralis*, Mg., *ornatus*, Mg., *diversus*, Theob., *nigripes*, Ztt. var. *sylvæ*, Theob., *nigritulus*, Ztt., *lutescens*, Fabr.; *Grabhamia pulchripalpis*, Rond.; and *Tæniorhynchus richardii*, Fic.

Genus

ANOPHELES, Meigen.

Anopheles nigripes, Stæg.

Plate 2.

Specimens of this species in the Museum collection are from various localities between and including Colwyn Bay, Carnarvonshire, N. Wales, and Penzance, Cornwall: the species is on the wing from June to September. According to Theobald ('Monograph of the Culicidæ,' Vol. I., p. 202) it also occurs in Scotland, and what appears to be *A. nigripes* was recorded (without a specific name) from the North of Ireland by A. H. Haliday in 1828 ('Zool. Journal,' III., 1828, p. 501). Theobald (*loc. cit.*) writes of this species:—"It bites very viciously,

and the bite is somewhat annoying. It usually occurs on the wing at dusk. . . . . I have taken this mosquito in the daytime by beating dense bushes where it seems to pass the day in North Wales." The same writer states that *A. nigripes* "does not appear to come indoors," but the Museum possesses a female which bit and sucked blood, and was taken by Mr. F. W. Terry at Merton, Surrey, on June 6th, 1899, in a bedroom at night. According to Nuttall, Cobbett, and Strangeways-Pigg ('The Journal of Hygiene,' Vol. I., 1901, p. 12), in the British Islands *Anopheles nigripes* is much more rare than either of the other two species of the genus, although there is no difference in the distribution of any of them. Out of 156 British specimens of *Anopheles* from various localities, no fewer than 123 were Spotted Gnats (*A. maculipennis*,—Plate 4), 27 belonged to *A. bifurcatus* (Plate 3), and only six to the present species.

The geographical range of *A. nigripes* is said to include Northern Europe and North America.

Anopheles bifurcatus, Linn.

Plate 3.

This species, which occurs throughout Europe, from Lapland to Italy and the Mediterranean, is probably generally distributed in the British Islands, since it was recorded by Haliday from the north of Ireland, and the localities of the specimens in the Museum include Torphins, Aberdeenshire, N.B., and Penzance, Cornwall. According to Theobald (*op. cit.*, p. 198) this mosquito makes its appearance in England in April and May; a male and female were taken at Penzance by Mr. F. W. Terry on July 17th, 1901. Theobald writes that the female of *A. bifurcatus* attacks human beings, and is a very persistent blood-sucker; "it is much fiercer than the more common *A. maculipennis*," or Spotted Gnat (Plate 4). The same author adds that he has found the species chiefly in the neighbourhood of woods, and that malarial parasites are known to develop in it in Italy.

Anopheles maculipennis, Mg.

The Spotted Gnat.

Plate 4.

Like the foregoing species, this is one of the mosquitoes chiefly concerned in the dissemination of malaria in Italy at the present day. It is widely distributed in Great Britain, and is very common in many places. In Ireland it was recorded by Haliday in 1827 ('Zool. Journal,' Vol. III. 1828, p. 501) as occurring "in profusion, in the neighbourhood of Belfast, throughout the summer and autumn." In England, according to Theobald (*op. cit.* p. 193), the time of appearance of this species is "from March to May, and again from June to December." The same writer adds that:—"The majority appear in July and August. Females only occur early in the year." He also states that specimens "may be found in the daytime settled inside outhouses and privies." British females of *A. maculipennis* would appear sometimes to be less blood-thirsty than those of either of the foregoing species, and Theobald's experience has been that both sexes subsist entirely on vegetable food. If this is the case it would suggest that a change must have taken place in the feeding-habits of British females of this species, since the time when ague (malaria) was prevalent in this country. Nevertheless there can be no doubt that on occasion females of *A. maculipennis* in the British Islands suck blood at the present time. Thus, in their paper on 'The Geographical Distribution of Anopheles in Relation to the Former Distribution of Ague in England,' published in January, 1901, it is stated by Nuttall, Cobbett, and Strangeways-Pigg (*loc. cit.*, p. 10) on the basis of investigations made in the previous year:—"That the English *Anopheles maculipennis* is just as fond of blood as its continental *confrères* has been amply proved by experiment during July and August." Again, a correspondent who wrote from Langport, Somerset, on August 16th, 1905, and forwarded for identification specimens of this species and *Theobaldia annulata*, Schrk. (Plate 5), complained that:—"Since residing in Langport, which is on the level of Sedge-

moor, we have been troubled every summer with the enclosed gnats, which, coming into the bedrooms, assail the sleepers to such an extent that we have to adopt mosquito curtains."

Anopheles maculipennis, which occurs throughout Europe and has been met with in Palestine, is also widely distributed in Canada and the United States.

Before bringing to a close these brief notes on the British representatives of the malaria-bearing genus *Anopheles*, it may be interesting to reproduce the following "Conclusions" from the paper by Messrs. Nuttall, Cobbett, and Strangeways-Pigg already referred to (*loc. cit.* pp. 43-44).

"1. The disappearance of ague from Great Britain does not depend upon the extinction of mosquitoes capable of harbouring the parasites of malaria.

"2. Three species of *Anopheles* (*A. maculipennis*, *A. bifurcatus*, *A. nigripes*) are to be found in Great Britain in all districts which were formerly malarious, but also in places concerning which there is no record of the former prevalence of ague.

"3. The *Anopheles* to-day are most numerous in low-lying land containing many ditches, ponds, and slowly-flowing water, suitable for their habitat, and corresponding to the districts where ague was formerly prevalent.

"4. Since the disappearance of ague does not depend upon the extinction of *Anopheles* it is probably due to several causes operating together:

"(*a*) A reduction in the number of these insects consequent upon drainage of the land, this being in accord with all the older authors, who attributed the disappearance of ague largely to this cause.

"(*b*) Reduction of the population in infected districts as the result of emigration about the time when ague dis-

appeared from England. This would naturally reduce the number of infected individuals and thus lessen the chance of the *Anopheles* becoming infected.

"(*c*) It is possible that the use of quinine has reduced the chances of infecting the *Anopheles* through checking the development of the parasites in the blood of subjects affected with ague.

"Of these, the first-mentioned cause seems to have been chiefly operative.

. . . . . .

"6. Since the geographical distribution of *Anopheles* in England is wider than the former distribution of ague in this country, we are forced to conclude that it is not a matter of the geographical distribution of *Anopheles* as much as of their *numerical distribution.*

"7. Our observations having proved the existence of *Anopheles* in non-malarious districts, we believe that they will explain the occasional occurrence of ague in out-of-the-way places, without making it necessary to assume that malaria-bearing mosquitoes have been freshly-imported, for, given suitable conditions of temperature and the requisite number of *Anopheles*, a malarious subject coming from other parts might well infect the local insects, which in turn would spread the infection to healthy persons.

. . . . . ."

GENUS

THEOBALDIA, Neveu-Lemaire.

Theobaldia annulata, Schrk.

(*Culex annulatus*, Verrall, 'List of British Diptera,' 2nd Ed. (1901), p. 12.)

Plate 5.

This species is one of the largest of mosquitoes, is common in Great Britain, and may be met with either out of doors or in outbuildings and houses at all seasons of the year. The localities of the British specimens in the Museum range from Torphins, Aberdeenshire, N.B., to Penzance, Cornwall, and the dates of their capture include February 25 and December 25. The species is occasionally taken in the British Museum (Natural History), where it doubtless breeds in the water cisterns. Theobald writes (*op. cit.*, Vol. III. 1903), pp. 148-149:—"There is no doubt that this large mosquito hibernates in sheds, cellars, etc., during the winter. They are mainly noticed indoors in Kent in October, and now and then in the first week of November, but during the past year they were active both indoors and out right through the winter."

Theobaldia annulata bites very severely, and the puncture inflicted by it is often followed by local swelling and inflammation, as well as sometimes by constitutional disturbance. The varying effects of the bite in different individuals have been described by Dr. W. Hatchett Jackson (quoted by Theobald, *loc. cit.*, pp. 149-150), who, writing of an invasion of the town of Weston-super-Mare, Somersetshire, by this gnat in the autumn of 1902, says that "few persons in Weston and its neighbourhood" have escaped its attacks. As is the case, however, with all other mosquitoes, *T. annulata* is also able to subsist upon a vegetable diet, for the same writer observes:—"I saw no males after the second week in November, 1902, and at that time I noticed on a sunny day, in a warm nook of our garden, numbers of this gnat—all

females—flying about and settling on the stems of plants and inserting their proboscides, apparently engaged in sucking. The two plants attacked were the periwinkle (*V. major*) and young wallflowers." Dr. Hatchett Jackson adds:—"Most people at Weston are well acquainted with this species owing to its speckled wings, and it is usually to be met with in autumn in the woods on Worlebury Hill behind Weston on the north. Indeed it is sometimes spoken of as the 'Wood Gnat.'" In November, 1904, reports and specimens received from Leamington, Warwickshire, and Sleaford, Lincolnshire, showed that this species was again troublesome in different parts of the country.

The geographical range of *T. annulata* is very wide, for, besides being distributed throughout Europe, the insect also occurs in the Punjab, India, while in America it is found from Canada to Mexico.

Genus

CULEX, Linnæus.

Culex cantans, Mg.

Plate 6.

In the British Islands this gnat is apparently less common than some other species, and the only British specimens at present contained in the Museum collection are from Merton Hall, Thetford, Norfolk, June 10th, 1900 (*Lord Walsingham*); Cambridge (*F. V. Theobald*); Ledbury, Herefordshire, June 2nd, 1895 (*Lieut.-Colonel Verbury*); Ashford, Kent, August 12th, 1902 (*W. R. Jeffreys*); and Brockenhurst, New Forest, Hants, May 5th to 19th, 1904, and 6th to 12th, 1905 (*C. O. Waterhouse*). Theobald writes (*op. cit.*, Vol. III. (1903), p. 179 :—"*C. cantans* is a sylvan species, which Mr. W. R. Jeffreys, of Ashford, assures me is vicious in the woods in the Weald of Kent. It bites at dusk, especially choosing the ankles."

This species occurs throughout Europe, and is also found in India and Canada.

Culex nemorosus, Mg.

Plate 7.

This is another sylvan species, which, according to Theobald (*op. cit.*, Vol. II. (1901), p. 83), is common in England but has never been known to enter houses or outbuildings. The author referred to states that he has received specimens from "a great variety of places such as deep woods, the borders of lakes, along ditches, cuttings, etc." The British specimens in the Museum collection are from various localities between and including Torphins, Aberdeenshire, N.B., and the New Forest, Hants; the species was met with by the writer in the woods near Brinklow, Warwickshire, on June 30th, 1902. The time of flight is from May to August. Theobald writes (*loc. cit.*, p. 84):— "This wood gnat varies very considerably both in size and colour. I have seen the females only 6 mm. long, whilst others are 9 mm."

The geographical range of *C. nemorosus* includes the whole of Europe, from Lapland to Italy, and also extends to Canada.

Culex pipiens, Linn.

The Common Gnat.

Plate 8.

The Common Gnat is generally distributed in the British Islands, and may be met with in houses practically throughout the year. Theobald writes (*op. cit.*, Vol. II. (1901), p. 135):—"The females hibernate in cellars and outhouses, and appear mostly in March and April, but do not, as far as my observations go, deposit their eggs for some little time. No males are to be found in the early part of the year, the females having been fertilised by the males in the previous autumn. I have known this gnat active in numbers well into November in England, and they occur during the winter in houses."

During winter and early spring, Common Gnats are often to be found in swarms on the roofs of cellars, where their presence at that season of the year sometimes occasions a good deal of surprise. This species is often a troublesome blood-sucker, and, as most people know to their cost, even a solitary Gnat is capable of causing considerable annoyance in a bedroom at night. As regards his experience of the Common Gnat in Scotland, Colonel Yerbury says :—"This is another early pest, which was in numbers at Nairn and Brodie in the middle of May, 1905 ; eight or ten specimens could be seen at one time sitting on one's knickerbocker stockings."

Culex pipiens occurs throughout Continental Europe, and also in Malta, Algeria, Madeira, Teneriffe, and North America.

Genus

GRABHAMIA, Theobald.

Grabhamia dorsalis, Mg.

(*Culex dorsalis*, Verrall, 'List of British Diptera,' 2nd Ed. (1901), p. 12.)

Plate 9.

This species, which is quite the most handsome of our British mosquitoes, may easily be recognised by its bright tawny thorax marked with two longitudinal stripes of cream-coloured scales which meet behind, and by the striking pattern of the abdominal markings, which are clearly shown in the plate. *G. dorsalis* makes its appearance in August and September, when it is often locally abundant in some of the suburbs of London. At present it is impossible to say anything as to the distribution of this species in the British islands, since all the British localities whence it has hitherto been recorded are in England, for the most part in the southern counties. Theobald, however (*op. cit.*, Vol. II. (1901), p. 18), mentions its occurrence in Wyre Forest, Worcestershire (where it was taken by

Mr. G. C. Bradley), and states that he himself, has "found it in numbers in a garden at Rochester, where it caused much annoyance"; he also (*op. cit.*, Vol. III. (1903), p. 251) says that it occurs on "the banks of the Thames on the Essex side." In September, 1899, this mosquito was very abundant and troublesome at Camberwell, London, S.E., where its bites were stated to cause inflammation, swelling, and abscesses; and at the same period the species was also attracting attention in other London suburbs, such as Lewisham and Stamford Hill (N.).

With reference to its abundance at Aldeburgh, Suffolk, in August, 1895, Mr. Albert Piffard writes ('Entomologist's Monthly Magazine,' Series 2, Vol. VI. (1895), p. 227):—"One of the peculiarities of this pretty seaside town, which never fails to engage the attention of summer visitors, is the presence in vast numbers of a small species of gnat, which is always busy indoors and out of doors, in shade and even in bright sunshine, in inflicting a bite which has such a virulent effect on those unacclimatized, that but few hours elapse before each new arrival has the 'mark of the beast' set on him. The species is known by the inhabitants as the 'Norway Mosquito,' and I ascertained on enquiry that it had been abundant for at any rate the last twenty-five years. A tradition generally accepted here assigns its introduction to a particular yacht which used to ply between this port and Norway." Theobald says (*op. cit.*, Vol. II. (1901), p. 18) with reference to this species:—"The bite is very severe and the insect most ravenous in warm weather, biting both by night and day."

Outside the British Islands *G. dorsalis* is known to occur in Scandinavia, Denmark, Holland, Germany, and Austria.

Family

SIMULIDÆ.

Although undistinguished in the British Islands by any English name, the members of this family, of which it is probable that our fauna includes at least a dozen species, are only too well-known to all those who have had occasion to enter their haunts. The family consists of the single genus *Simulium*, which is universally distributed, and of which some sixty-six species, difficult to distinguish from one another, have been described up to the present time. The females of some of these flies, which are among the most dreaded of all blood-sucking Diptera, sometimes occur in enormous swarms, and by their attacks upon horses, mules, and cattle, especially in certain parts of the United States, occasion great losses among these animals, besides molesting human beings. In the district of South Hungary called the Banat the Columbacz Midge (*Simulium columbaczense, Schönb.*) has been notorious for more than a hundred years owing to the destruction caused by it among cattle.

In appearance Simulidæ are small black or greyish flies, not exceeding 4 mm. in length, with a conspicuously humped thorax, short straight antennæ, broad and delicate iridescent wings, stout legs, and a short proboscis which is not visible from above. The males, which are incapable of sucking blood, are fond of dancing in the air in the sun ; as a rule they are much darker in coloration than the females, and are often velvety black, with silvery markings on the front of the thorax.

The preliminary stages are passed in running water. The eggs are deposited in a compact layer or gelatinous mass on stones or plants close to the water's edge. The larval stage lasts for about four weeks in the summer, though longer in cold weather, and the winter is passed in this stage. In shape the larva is somewhat like a tiny leech, broadening out posteriorly, where it is attached by means of a sucker to a stone, the stem of a water-plant, a dead leaf, or other object. The larva is able to shift its position by crawling in a looping fashion, but usually remains in a more or less erect position.

It feeds on algæ, diatoms, and parts of phanerogamous plants, which are brought to the mouth by means of the currents set up by two broad fan-like organs situated upon the head. In colour the larva varies according to the species, and perhaps also to some extent in accordance with its food, from deep shining black to yellow or dark green. When mature, the larva spins a silken cocoon within which it pupates, and in which the pupa remains motionless, breathing by means of a pair of branched respiratory filaments, which project from behind the head. The pupal stage lasts for about a week, and the perfect insect, making its escape through a rent in the back of the thorax, ascends to the surface in a bubble of air, and makes its way to the stem of a rush or some similar support on which it rests until its tissues are sufficiently hardened to enable it to fly.

Genus

SIMULIUM, Latreille.

Simulium reptans, Linn.

Plate 10.

So far as present experience goes, this would appear to be essentially a northern species, since all the British specimens of it in the Museum collection come from beyond the Tweed. A very similar species, which is common in the midland and southern counties of England, is distinguished from *S. reptans* by the middle tibiæ of the male being wholly brown, or, at any rate, not conspicuously silvery-yellow at the base, and by the hind tarsi in the female being less clear yellow on the basal two-thirds. Well-preserved females of *S. reptans* show on the anterior half of the thorax a whitish-grey blotch on each side above the anterior angles, which unfortunately does not appear in the plate; besides this, the thorax is clothed with a closely-fitting coat of minute golden hairs, the tibiæ, with the exception of the tips, are in reality conspicuously

silvery-yellow, and the basal joint of the front tarsus is broader than it appears in the illustration.

The localities and dates of the Museum specimens are as follows:—Kinlochewe, Ross-shire, N.B., May 23rd, 1892 (*W. R. Ogilvie Grant*); Nairn, N.B., May 20th to June 4th, 1905 (*Lieut.-Colonel Yerbury*); Brodie, Elgin, N.B., May 30th, 1905 (*Lieut.-Colonel Yerbury*); Nethy Bridge and Spey Bridge, Inverness-shire, N.B., June 14th to July 7th, 1905 (*Lieut.-Colonel Yerbury*). According to Colonel Yerbury, *S. reptans* "occurs in countless numbers in the Abernethy Forest in June and July, and causes great annoyance. A sweep or two with the butterfly net round one's head results in a perfect holocaust of victims." Of *S. hirtipes*, Fries,—a dark-legged species,—Colonel Yerbury writes that it is "the earliest of the biting pests in Scotland. It was found in numbers at Dunkeld so early as the 8th May."

Family

TABANIDÆ.

(Horse-flies, or Breeze-flies, Dun-flies, Clegs and Stouts, frequently called Gad-flies; in Kent the species of *Hæmatopota* are locally known as *Brimps*.*)

In the British Islands, as elsewhere, the horse-flies, owing to the size of many of the species, are the most formidable in appearance of all the blood-sucking Diptera. Indeed a large female of *Tabanus sudeticus*, Zlr. (Plate 20), measuring nearly an inch in length, with a wing expanse of over an inch and three-quarters, is exceeded in size by but very few exotic species of this family, and frequently excites the surprise of those who are not entomologists, when they learn that it is really a British insect. The horse-flies, which are world-wide in their distribution, are also among the largest of all families of Diptera, the total number of species described at the end of the year 1904 being no less than 1,560. In the British Islands there are twenty-two recognised species belonging to the genera *Hæmatopota*, *Therioplectes*, *Atylotus*, *Tabanus* and *Chrysops*. Of *Pangonia* (which, as regards number of species, is the second of the principal genera of this family, and is remarkable for the length of the proboscis, which, in some species, greatly exceeds that of the body) there is no British representative.

In appearance the Tabanidæ are bulky-bodied flies, with a large head, which is convex in front and concave or flattened behind. In the male the head is almost wholly composed of the eyes, which meet together above in that sex but are separated in the female. The males have an area in the upper portion of the eyes, varying in extent according to the species, composed of larger facets than those below. In life the eyes usually exhibit golden green or purple markings, which are of value for the identification of species, and are especially brilliant in the case of the females of *Chrysops* and *Hæmatopota*, which, as pointed

* *Apud* F. V. Theobald, 'Second Report on Economic Zoology' (British Museum (Natural History). London, 1904), p. 15.

out by Girschner ('Berliner Entomologische Zeitschrift,' Bd. xxxi. (1887), p. 156) "possess probably the finest eyes of all insects." After death, however, the colour of the eyes rapidly changes to a dull brown or brownish-black, until scarcely a trace of the markings remains.*

In front of the eyes project conspicuously the three-jointed antennæ, and below the head in all the British forms depends vertically the fleshy proboscis, or lower lip, which encloses the piercing mouth parts. The palpi, which lie one on each side of the proboscis, are swollen and fleshy, and differ in shape in the two sexes. The body is clothed with short hair and totally devoid of the large bristles known as macrochætæ.

In the coloration as in the shape of the body horse-flies throughout the world show remarkably little variation, and the British species are consequently very similar in appearance to many of those belonging to the same genera found in Central Africa, India and elsewhere. Some shade of brown or black is the most frequent hue, though the abdomen is often lighter or exhibits lighter markings. The wings, which, when the insect is at rest, diverge at the tips or are somewhat tectiform (sloping like the roof of a house), have in the case of *Hæmatopota* and *Chrysops* characteristic markings, which are well shown in the plates.

Horse-flies may be met with throughout the summer in fields, open spaces in woods, or by country roadsides. The edges of woods are favourite haunts of certain species, and when resting in such a place on a hot day one may frequently notice a *Hæmatopota* or two or a specimen of one of the smaller species of *Tabanus* crawling with much deliberation over one's coat and making preliminary investigations with its proboscis. The females alone suck blood; the males of certain species may occasionally be met with on flowers or sometimes hovering in the air. The species of *Hæmatopota* and *Chrysops*, and the smaller species of *Tabanus* are remarkable for the quietness with which they alight on their victims, the sharp prick of the bite being often the first intimation of the presence of the fly. The larger species of *Tabanus* betray their approach by their deep hum. When once the operation of sucking blood has commenced, horse-flies, like other

* In the plates to this work the eyes are shown as seen in dried specimens, from which the drawings had perforce to be prepared; but so far as possible the natural colour and markings are indicated in the notes on each species.

blood-sucking Diptera, may easily be captured or killed. Owing to the size of the Tabanidæ, the wound inflicted by the mouth-parts of many of the species is especially severe. Anyone who has seen *Tabanus bovinus* (Plate 19) attacking horses must have noticed the large drops of blood that exude and trickle from the spots bitten by the flies. Among domestic animals, however, horses and cattle are not the only victims, for in other countries mules, camels, and elephants suffer severely. Wild animals are similarly tormented; thus in 'The Nile Tributaries of Abyssinia' (London: Macmillan & Co., 1867), p. 210, the late Sir Samuel Baker, writing of the country between the Settite and the Atbara Rivers, mentions herds of game as retreating from the south before the attacks of the "Seroot," under which name several species of *Tabanus* and *Pangonia* are known to Europeans on the Blue and White Niles. As regards the attacks of horse-flies upon human beings, abundant though certain species such as those of *Hæmatopota* occasionally are in the British Islands, we have to turn to continental records in order to understand how serious a pest these flies may become owing to their extraordinary blood-thirstiness. Thus, according to Portschinsky 'Die Bremsen (Tabanidæ) und die einfachste Methode dieselben auszurotten.' [In Russian.] Published by the Ministry of Agriculture and State Domains: St. Petersburg, 1899, pp. 19.—Summary in German by N. Von Adelung, 'Zoologisches Centralblatt,' VII. Jahrg. (1900), pp. 807-808), in the Gdov District of the St. Petersburg Government, in Russia, horse-flies in summer are so excessively numerous and bloodthirsty that agricultural operations have to be carried out by night; while in parts of Siberia, such as the shores of the River Om, settlers have been compelled entirely to abandon the zone infested by these flies. Noticing that horse-flies frequently seek pools in order to drink, Portschinsky hit upon the expedient of covering with a thin layer of petroleum the surface of the water in certain lakes and pools in districts infested by the flies. The result was a brilliant success, and the insects were destroyed in enormous numbers, the majority on attempting to drink adhering to the layer of oil, while others although they managed to fly away, were subsequently choked or poisoned by the petroleum. In this way certain localities, such as the Park of Pawlowsk near St. Petersburg, were completely cleared of these troublesome Diptera. It is interesting

to note that no specimens of *Hæmatopota* came to drink at the pools, so that the species of this genus cannot be destroyed by the method indicated. A layer of petroleum on the surface of the water is fatal to aquatic horse-fly larvæ, just as it is to those of mosquitoes.

Tabanidæ deposit their spindle-shaped brown or black eggs closely packed in rounded or flattened masses, which are attached to the leaves and stems of rushes or "other smooth surfaces over water or wet ground" (Hart). The larvæ are whitish soft-bodied grubs, and are found in water, in earth, or in decaying wood. In shape they are cylindrical, tapering at each end, with a small retractile head, and with the first seven of the eight abdominal segments each encircled near its anterior margin with a ring of fleshy protuberances, of which there are "two transverse dorsal, one lateral on each side, and four rounded ventral ones."* Horse-fly larvæ are carnivorous, preying upon beetle larvæ, snails, worms, etc. The pupa which is not unlike that of a Lepidopterous insect, remains stationary in the earth or water.

Tabanidæ are sometimes preyed upon by robber-flies (Asilidæ); thus at Brockenhurst, in the New Forest, on July 14th, 1894, Colonel Yerbury took a female *Machimus atricapillus*, Fln., feeding upon a male *Chrysops cæcutiens*, Linn., both of which specimens are now in the Museum collection. In foreign countries horse-flies are also "a favourite food of the fossorial wasps of the family Bembecidæ. These wasps are apparently aware of the blood-sucking habits of their favourites, and attend on travellers and pick up the flies as they are about to settle down to their phlebotomic operations."†

In Illinois, U.S.A., a parasitic Hymenopteron (*Phanurus tabanivorus*, Ashmead) has been bred from egg-masses of *Tabanus atratus*, Fabr., one of the largest and commonest of North American horse-flies, and in Austria an allied species (*Phanurus* (*Telenomus*) *tabani*, Mayr) was bred by the late Professor Friedrich Brauer from the eggs of an undetermined species of *Tabanus*.‡

* Hart, 'Bulletin of the Illinois State Laboratory of Natural History,' Vol. IV. (1895), p. 222.

† D. Sharp, 'The Cambridge Natural History.—Insects: Part II.' (London: Macmillan & Co.: 1899). P. 482.

‡ Hart, *loc. cit.*, p. 245, and Ashmead, *ibid.*, p. 276.

GENUS

HÆMATOPOTA, Meigen.

Hæmatopota pluvialis, Linn.

Plate 11.—Fig. 1, ♂; fig. 2, ♀.

This species is one of the commonest and most generally distributed of British blood-sucking flies. It occurs throughout the British Islands, and is even to be met with in London suburbs, as shown by a specimen taken at Fulham, on July 12th, 1891. The dates on the specimens in the Museum collection prove that the perfect insect is on the wing from June to August inclusive. On the continent of Europe *H. pluvialis* is equally widely distributed, and the Museum series includes examples from various localities, from Norway to Italy and Spain.

With reference to this species Curtis writes ('British Entomology,' 1834) that it is "common everywhere in woods, on palings in lanes &c., in June, July, and August, in England, Scotland, and Ireland; the females, which attack both men and horses, sometimes appear in myriads without one male."

The preliminary stages of *H. pluvialis* are passed in the soil (humus).

Hæmatopota crassicornis, Whlbg.

Plate 12.

Care is needed for the distinction of this species from the foregoing, with which it agrees in distribution. So far as coloration, however, goes, *H. crassicornis* is distinctly the *darker* species of the two, while in both sexes the light stripes on the thorax are more conspicuous.

The smallest specimen of this species in the Museum collection, a female taken in the Avon Valley, S. Devon, by Lieut.-Colonel Yerbury, on June 19th, 1896, measures 8 mm. in length; the largest specimen, a male taken by the writer at Gravesend, Kent, on June 28th, 1894, is 11 mm. long, exceeding the largest British example of *H. pluvialis* by 1 mm. The Museum series of *H. crassicornis* is from various localities between and including Glen Avon, S. Banffshire, N.B. *W. R. Ogilvie Grant*, and Avon Valley, S. Devon *Lieut.-Colonel Yerbury*; the dates of these specimens range from May 24th (Avon Valley, S. Devon, to July 27th (Gravesend: *E. E. Austen*). There are also Irish examples from Glengariff, Co. Cork, June 12th and 14th, 1901 (*Lieut.-Colonel Yerbury*); and Leenane, Co. Galway, July 14th, 1892 *E. E. Austen*. It is impossible to say anything as to the range of this species outside the British Islands, since at present the Museum possesses no examples from abroad.

With reference to this and the foregoing species Colonel Yerbury writes:—"Though common in Scotland, these species are not such pests there as in the south of England. As an instance of the numbers in which they are sometimes met with, the following extract from one of the writer's old diaries may be quoted:—"Loddiswell, S. Devon, June 30th, 1896, *Hæmatopota* galore: killed forty-seven flying round me."

Hæmatopota italica, Mg.

This species can at once be distinguished from either *H. pluvialis* or *crassicornis* by the pale femora and the greater length of the antennæ. The largest of three females of *H. italica* in the old Stevensian collection of British Diptera, which is unfortunately entirely without locality labels, exceeds in size any British specimens of *H. pluvialis* or *crassicornis* in the Museum series, and measures 12 mm. in length, exclusive of the antennæ, which are 2½ mm. long.

In the British Islands, so far as our present knowledge goes, *Hæmatopota italica* would appear to be much more rare and local than either of the other indigenous species of this genus. The only modern British specimen in the Museum collection is a female, 10 mm.

in length, from Netley, Hants, July 22nd, 1893 (*Miss Gertrude Ricardo*). The species has, however, also been taken in recent years by Mr. L. C. Chawner in the New Forest, Hants, and by Mr. G. H. Verrall in Canvey Island, Essex. It may be noted that the specimen figured by Curtis ('British Entomology,' 1834) was also from Essex (Mersea Isle). Continental specimens of this species in the Museum collection are chiefly from southern localities (Italy, the Morea, Greece, and Cyprus). In Austria, according to Schiner ('Fauna Austriaca.—Die Fliegen (Diptera),' I. p. 39), *Hæmatopota italica* is more common than *H. pluvialis*; it is, however, not certain that Schiner's interpretation of Meigen's *H. italica* is the same as that current in this country, since, according to the Austrian Dipterist, the femora should be black. Meigen's original description, which merely states that *H. italica* is distinguished from *H. pluvialis* by the antennæ, says nothing about the femora.

Genus

THERIOPLECTES, Zeller.

Therioplectes micans, Mg.

Plate 13.

This is a shining black species, distinguishable from the *bisignatus* form of *Th. tropicus* (Plate 16), which it resembles in appearance, by the legs being entirely black. Further means of recognition are afforded in the male by the presence of a bunch of long erect hairs at the end of each of the first four joints of the front tarsi; and in the female by the frontal triangle (the area of the head between the anterior angles of the eyes and the antennæ) being, with the exception of a narrow border immediately above the base of each antenna, shining black instead of dull grey. In the case of the male, the eyes of the living insect are described by Brauer (Denkschr. k. Akad. Wiss., math.-naturw. Cl., 42 Bd. (1880), p. 137) as "on the lower half with three purple bands on a bright green ground, and purple-

coloured lower margin ; or bluish-violet, underneath with three green bands bordered with red " ; the eyes of the female are green, with from three to four purple bands. The abdomen of the female is rather broad."

Of this species there are no modern British specimens in the Museum collection. Colonel Yerbury writes that it is "very rare," and that he has met with it "only at Fordingbridge, Hants, and Barmouth, North Wales." According to Brauer (*loc. cit.*, p. 138), Mr. Verrall has taken it at Lyndhurst, New Forest, Hants, in June. The Continental series of *Th. micans* in the possession of the Museum includes specimens from Rhenish Prussia and Bohemia.

Therioplectes borealis, (Mg. *pro parte*) Brauer.

The only British specimen of this mountain species in the Museum collection is a male from Glen Avon, S. Banffshire, N.B., June 8th, 1893 *H. R. Ogilvie Grant*, of which the dimensions are—length, 15 mm. ; width of head, 5 mm. ; wing expanse, $27\frac{1}{2}$ mm. The general coloration of the insect is brown, with a chestnut-coloured patch on each side of the second and third abdominal segments ; the hind margin of the first segment is also of the same colour on each side, and there is just a trace of a similar patch on each side of the fourth segment. The eyes of this male are densely clothed with light yellowish-brown hair, and the facets on the upper two-thirds of each eye, except the hind margin, are conspicuously larger than those below, the change from the large to the small facets being somewhat abrupt.

According to Brauer (*loc. cit.*, pp. 143, 144), in the living insect the eyes of the male are "green, with one or two purple bands," while those of the female are described as "green, with three broad purple bands, sometimes very dark." Brauer states that the front (*i.e.*, the space between the eyes in the female is "very broad and short, at the most from two and a-half to three times higher than broad."

Of Continental specimens of this species the Museum possesses a male from Alten, Finmark, July, 1903 (*Sir G. F. Hampson, Bt.*) ;

a female from the same locality, presented by the Entomological Club, in 1844; and a second female, taken at Marcha, near Yakutsk, Siberia, on June 7th, 1900. According to Brauer, *Th. borealis* ranges from Lapland and Sweden to the Austrian Alps.

Therioplectes montanus, Mg.

Plate 14.

In British specimens of this species there is a considerable difference in appearance between the two sexes, due partly to the male abdomen being more pointed at the tip (as is also the case in other species), and partly to the contrast of colours in the abdomen being much sharper in the male than in the female. Of three males of *Th. montanus* in the Museum collection, from Loo Bridge, Co. Kerry, Ireland, the smallest is 12, the largest 13½ mm. in length; the length of seventeen Scotch and Irish females varies from 12 to 14¼ mm. Continental specimens are larger, and may attain a length of 16 and 17 mm. in the case of the male and female respectively.

The area of enlarged facets in the upper portion of the eyes of the male is not sharply distinguished from the remainder of the eye-surface. Brauer (*loc. cit.*, pp. 144-145) describes the coloration of the eyes of the male as "green, with three purple bands and red lower margin bordering the face"; while, with reference to the female he writes: "Eyes emerald-green, with three linear carmine-red bands, the middle one of which often does not reach the hinder margin of the eye; upper and lower margin emerald-green."

So far as regards the British fauna, *Th. montanus* would appear to be essentially a Scotch and Irish species, since the Museum collection includes no specimens from England or Wales. Colonel Yerbury's note runs: "Very common in Ireland, at Loo Bridge and other places in County Kerry; common, too, in Scotland, where in July it succeeds *Th. luridus* in the sand-hills; it also occurs, among other localities, on the lower slopes of the Cairngorms." The Scotch specimens in the Museum are from Invershin, Sutherland; Nairn; Brodie, Elgin; Nethy Bridge, Inverness-shire; and Rannoch, Perth-

shire; all taken by Colonel Yerbury between July 3rd and 26th inclusive. From Ireland there are examples from Leenane, Co. Galway, and Lough Conn, Co. Mayo, July 14th and 27th (*E. E. Austen*); and from Loo Bridge, Co. Kerry, July 6th-8th (*Lieut.-Colonel Yerbury*). The Continental series is from various localities from Norway to Rhenish Prussia. The range of the species as given by Brauer, in addition to Germany and Austria, includes Sweden, Russian Lapland, South Russia, and Eastern Siberia.

Therioplectes luridus, Fln.

Plate 15.

This handsome species resembles the foregoing (*Th. montanus*) in size, while (as may be seen from a comparison of Plates 14 and 15) the general arrangement of the light and dark markings in the abdomen is similar to that presented by females of *Th. montanus*, in which the lateral ochraceous patches are well developed. The colours in the abdomen of *Th. luridus*, however, are much richer; the black area is deeper in tone and more shining, while the lateral patches are chestnut instead of ochraceous. The predominance of black makes this *a distinctly darker species* than the foregoing. In both sexes of *Th. luridus* the hairy covering of the eyes is longer and darker than in *Th. montanus* (dark brown instead of yellowish brown or yellowish). Brauer (*loc. cit.*, p. 148) describes the eyes of the male as "green, with three purple bands and red margin next the face," and those of the female as "green, with three purple bands."

The length of two males of *Th. luridus* in the Museum collection, from Brodie, Elgin, N.B., June 9th and 10th, 1905 (*Lieut.-Colonel Yerbury*), is 12⅝ and 13¼ mm. respectively; seventeen Scotch females vary in length from 11½ to 14⅛ mm. The dimensions of Continental specimens are much the same, though a male from Norway measures as much as 14 mm. in length.

A long series of this species was taken by Colonel Yerbury at Brodie, from June 5th to June 10th, and at Nethy Bridge, Inverness-shire, N.B., from June 12th to July 1st, 1905. It will be observed

that the female specimen illustrated in Plate 15, which was taken by Colonel Yerbury at Aviemore, Inverness-shire, on June 5th, 1904, has a small appendix to the upper branch of the third vein in each wing, and traces of a similar appendix are to be seen in some of the other specimens in the Museum. In the British Islands *Therioplectes luridus* would appear to be a northern species, and as yet the Museum possesses no specimens from either England, Wales, or Ireland. Colonel Yerbury writes:—"In Scotland this is the earliest of the Tabanidæ. In May 1905, it was met with in numbers near Nairn, when both sexes were found sitting on a sandy road leading to Mairston Sand Hills. A single female was taken at Aviemore on June 5th, 1904. Probably all the Tabanidæ seen by me in Scotland at this time of the year belonged to this species." The Continental specimens of this species in the Museum collection are all from Norway; additional localities given by Brauer are Swedish-Lapland, Sweden, Poland, Silesia, and Bohemia.

Therioplectes tropicus, Pz. (*nec* Mg.).

(Form *bisignatus*, Jaenn.)

Plate 16.

In its typical form this species has an ochraceous or ochraceous-buff patch on each side of the abdomen extending from the posterior angles of the first to the posterior margin of the third or anterior border of the fourth segment, leaving a broad median black stripe one-third of the abdomen in width. Two males in the possession of the Museum from Oxshott, Surrey, June 9th, 1895 (*Lieut.-Colonel Yerbury* and *W. R. Ogilvie Grant*), and Chattenden Roughs, Kent, July 12th, 1902 (*H. W. Andrews*), respectively are of this character, but the whole of the British females in the Museum series [15] are of the melanochroic form *bisignatus*, of which a specimen is illustrated in Plate 16, which accordingly would appear to be the common British form of the female of this species. As a further proof of this conclusion it may be mentioned that at Oxshott on June 9th, 1895,

Colonel Yerbury and Mr. W. R. Ogilvie Grant took, in addition to the normal male already mentioned, three females of the *bisignatus* form. In many of the females in the Museum collection there is no trace of the russet markings on the sides of the second abdominal segment seen in the specimen shown in the plate, but the abdomen appears wholly black, with, however, a longitudinal row of whitish markings on each side of the median series of white triangles. The resemblance between the form *bisignatus* and *Therioplectes micans*, Mg., has already been alluded to in the notes on the latter species (see page 37).

The two males of *Th. tropicus* referred to above are 14½ mm. in length, with a wing-expanse of 28 mm.; the length of the females varies from 14 to 15⅔ mm. According to Brauer (*loc. cit.*, pp. 146-147) the eyes in this species are green with three purple bands; in the male the lower margin is green and unbanded. The Museum possesses no specimens of this species from Wales, Scotland, or Ireland, but in England at any rate *Th. tropicus* appears to be among the more common of the larger horse-flies. The dates of capture of the females in the Museum series range from May 16th to July 12th inclusive, and the localities are Brinklow, Warwickshire (*E. E. Austen*); Berkhamsted, Herts (*W. R. O. Grant*); Felden, Boxmoor, Herts (*A. Piffard*); Colchester, Essex (*W. H. Harwood*); Oxshott, Surrey (*W. R. O. Grant* and *Lieut.-Colonel Yerbury*); and New Forest, Hants (*Lieut.-Colonel Yerbury* and *C. O. Waterhouse*). In the last-mentioned locality Colonel Yerbury notes that *bisignatus* is the common form of the species. Continental specimens of *Th. tropicus* in the Museum collection are from Siberia, Norway and Russia (typical form), and from Rhenish Prussia (form *bisignatus*). Additional Continental localities given by Brauer are Sweden, Germany and Austria for the typical form, and France, Silesia and Asiatic Russia for the form *bisignatus*, which was originally described from a specimen from the neighbourhood of Paris.

Therioplectes solstitialis, Schin., Brauer (? Mg.).

Plate 17.

In this species, which is the most brightly coloured of the larger British Tabanidae, the two sexes are alike in coloration, though the black median dorsal stripe on the abdomen is usually narrower and more distinctly defined in the male. Of eight British males in the Museum collection the smallest is $14\frac{3}{4}$, the largest $16\frac{1}{2}$ mm. in length, while twenty females vary in length from $14\frac{1}{2}$ to 17 mm. The eyes of the male according to Brauer (*loc. cit.*, p. 150, are "dark green, with a strong purple sheen above, with two purple bands on the lower third, and with the rudiment of a similar band on the edge of the larger facets"; those of the female are described as "bright green, with a coppery sheen, or bluish green, with three narrow purple bands, which often have a yellow edging."

The dates of capture of the Museum series of *Th. solstitialis* range from June 13th to July 22nd inclusive. The localities are, in Scotland: Nethy Bridge and Aviemore, Inverness-shire; Nairn; Brodie, Elgin; and Rannoch, Perthshire (*Lieut.-Colonel Yerbury*); Taynuilt, Argyll-shire (*A. Beaumont*); and Goatfell, Arran (*Sir G. F. Hampson, Bt.*). In Wales: Barmouth, Merionethshire (*Lieut.-Colonel Yerbury*). And in England: Tarrington, Herefordshire; Lyndhurst, New Forest, and Ringwood, Hants (*Lieut.-Colonel Yerbury*); Beaulieu, Hants (*Miss Gertrude Ricardo*); Avon and Walkham Valleys, S. Devon (*Lieut.-Colonel Yerbury*); and near Bude, Cornwall (*B. G. Rye*). In the Museum general collection there are specimens from Norway, and the localities given by Brauer show that the species occurs southwards as far as Hungary and the Tyrol, and eastwards on the Amur river in Russian Asia.

Colonel Yerbury writes that in Great Britain *Th. solstitialis* is "very common and generally distributed. The males are frequently seen hovering over roads through woods, and the habit seems to be confined to this species. Although not painful, the bite of the female is very severe, and draws blood more often than that of any other species."

GENUS

ATYLOTUS, Osten Sacken.

Atylotus fulvus, Mg.

Plate 18.

The general ochreous colour of the body will serve to distinguish this species, which is one of the rarer of our British horse-flies. Rubbed specimens, however, look darker owing to the disappearance of the short silky golden hairs, which cover the body and produce the characteristic hue, and in the specimen figured in the plate these hairs are unfortunately wanting on the abdomen.

The only British specimens of *A. fulvus* that the Museum possesses are a male, from Lyndhurst, New Forest, Hants, June 24th, 1897, and five females, from the same locality and Lyndhurst Road, June 29th and July 8th, 1897 (*Lieut.-Colonel Yerbury*); Beaulieu, Hants, July 15th, 1898 (*Miss Gertrude Ricardo*); and Kenmare, Co. Kerry, Ireland, June 30th, 1901 (*Lieut.-Colonel Yerbury*). The length of the male is 14½ mm.; that of the five females varies from 14⅝ to 15¼ mm. The eyes of the male are usually without bands; those of the female are described by Brauer (*loc. cit.*, p. 170) as "pale olive-green, with an oblique fine dark line and shot with several almost black round spots." In the male of this as of the following species an area in the upper half of the eye, running from the inner nearly to the outer margin, is composed of much larger facets than the remainder.

Writing of *A. fulvus* Colonel Yerbury says that it is "a rare species," and that he has met with it "only in the New Forest, and at Glengariff and Kenmare in Ireland."

The Continental series of this species in the Museum collection includes examples from Hungary, Switzerland, and Spain. According to Brauer it is generally distributed throughout Central and Southern Europe, and is also found in Scandinavia, Russia, and Asia Minor.

Atylotus rusticus, Fabr.

In the British Islands this species is even more rare than the foregoing, from which it may be distinguished by the greyer tint of the short hair covering the body. The dimensions are similar to those of *A. fulvus*. The eyes of the male sometimes have a purplish transverse line at the junction of the large and small facets; similarly those of the female are either unbanded or in some cases have a single narrow band.

The only modern British example of this species in the Museum is a male from North-east Essex (*W. H. Harwood*), of which the date of capture is unfortunately unknown; but a male and female without locality labels are contained in the old Stevensian collection. The general collection of Diptera includes specimens from France, Hungary, and Algeria. The localities given by Brauer (*loc. cit.*, p. 169) show that the species is distributed throughout Central and Southern Europe.

Genus

TABANUS, Linnaeus.

Tabanus bovinus, Lw. (Schiner *pro parte*.)

Plate 19.

This and the following species, *Tabanus sudeticus*, Zlr. (Plate 20) are the bulkiest of all British Diptera, and on the whole *T. sudeticus* is slightly the larger of the two. Although as a rule specimens of the latter species are distinctly darker than those of *T. bovinus*, the females are often difficult to distinguish, and it is by no means easy to give thoroughly satisfactory characters for their separation. The males of the two species, on the other hand, can readily be distinguished owing to the fact that while the facets in the upper half of the eye of *T.*

bovinus are not noticeably larger than those in the lower, the facets in the upper two-thirds of the eye of the male *T. sudeticus* are, with the exception of those on the hind margin, at least four times the size of the rest. In both species the eyes are devoid of bands, and, according to Brauer (*loc. cit.*, pp. 184, 185), in the living insect, while those of the male of *T. bovinus* are entirely green, the eyes of the male *T. sudeticus* are "blackish, with a coppery sheen, the larger facets greyish, the smaller ones more reddish." In the case of the females the colour of the eyes is given by Brauer (*loc. cit.*, p. 136) as "emerald green" in *T. bovinus*, and as "always blackish-brown, with a coppery sheen" in *T. sudeticus*. In both sexes the pale hind margins of the abdominal segments are usually more distinctly marked off from the ground colour in *T. sudeticus* than in *T. bovinus*.

The British series of *Tabanus bovinus* in the possession of the Museum includes two males (both of which are from the Waller Clifton collection, and unfortunately without either localities or dates), and nine females, all from the southern counties; the following are the localities and dates of the female specimens:— Oxshott, Surrey, June 16th, 1895, (*W. R. Ogilvie Grant*); Farnham, Surrey, July 13th, 1899,—"on window of Sub Post Office" (*A. Raxelius*); Froyle, Hants, July 6th, 1893 (*W. R. Ogilvie Grant*); Lyndhurst, New Forest, Hants, June 30th, 1894 (*Lieut.-Colonel Verbury*), July 21st, 1890 (*F. W. Frohawk*), and August, 1893 (*L. C. Chaxener*); Ringwood, Hants, June 29th, 1894 (*Lieut.-Colonel Verbury*); and Ivybridge, S. Devon, July 26th, 1889 (*Lieut.-Colonel Verbury*).

The two males are respectively 20 and 21½ mm. in length, and their wing-expanse is 37½ mm. in the one case and 39 mm. in the other. The smallest British female in the Museum series is 21¼ mm. in length, the largest 23⅞ mm. (wing-expanse 47 mm.).

In addition to British specimens of *T. bovinus*, the Museum possesses examples from the South of France, Hungary, and Polish Ukraine. Additional localities given by Brauer show that the species is found from Sweden to Italy, and eastwards to Siberia and the Amur.

Of the habits of this species Brauer writes (*loc. cit.*, p. 187):— "The females swarm round horses, cattle, and deer. The males hover in the air in clearings in woods, and above somewhat elevated places

in meadows, but not on mountain tops; they do this especially on sultry, thundery days, in the sun after downpours of rain, or early in the morning."

Tabanus sudeticus, Zlr.

Plate 20.

The British specimens of this fine species in the Museum collection consist of one male (length 20½ mm. and thirteen females; the length of the latter ranges from 20½ to 24½ mm.; the wing-expanse of the largest female is 48 mm. In view of the particulars as to this species already given (see *T. bovinus*), it is now only necessary to refer to the localities and dates of our specimens. Brauer (*loc. cit.*, p. 185) states that in Austria *T. sudeticus* is on the wing much later in the year than *T. bovinus*, and that while the latter occurs in May and until the middle of June, the former is met with at the end of June and throughout July and August. In the British Islands, however, the time of flight of the two species would seem to be pretty much the same. The localities and dates of the British specimens of *T. sudeticus* in the Museum collection are as follows:—Brodie, Elgin, N.B., August 2nd, 1905 (*Lieut.-Colonel Yerbury*); Nethy Bridge, Inverness-shire, N.B., July 8th and 9th, 1905 (*Lieut.-Colonel Yerbury*); Drimmin, Sound of Mull, Argyllshire, N.B., 1904 (*Miss Henrietta Brown*; Birnam, Perthshire, N.B., August 25th, 1894 (*H. S. Barr*); Goat Fell, Arran, N.B., June 20th, 1893 (*Sir G. F. Hampson, Bt.*); Felden, Boxmoor, Herts, July 7th, 1893 (*A. Piffard*); Budshead Wood, S. Devon, July 1st, 1889 (♂), and Walkham Valley, S. Devon, July 31st, 1896 (*Lieut.-Colonel Yerbury*); Kenmare, Co. Kerry, Ireland, June 28th, and July 7th and 10th, 1901 (*Lieut.-Colonel Yerbury*); and Glencar, Co. Kerry, August 16th, 1901 (*Lieut.-Colonel Yerbury*).

Colonel Yerbury writes:—"*Tabanus sudeticus*, Zlr., was the commonest horse-fly at Kenmare in July, 1901; in Scotland it seems to be rather an uncommon species. *T. sudeticus* and *T. bovinus*

both make a deep hum when flying round one, quite unlike the note produced by the smaller Tabanidæ."

The Museum general collection of Diptera contains specimens of *T. sudeticus* from Hungary and Spain; additional localities given by Brauer show that the species is generally distributed throughout Europe. Writing with reference to Austria, Brauer says:—"Before sunrise the males hover and swarm in the air above the highest mountain-tops, *e.g.*, the Dobratsch according to Buchmüller and Hohen Zinken as stated by Frauenfeld, and sit on fences in the sun during the morning after emerging from the pupa; the females are found on the leaves of shrubs and on cattle."

Tabanus autumnalis, Linn.

Plates 21 and 22.

The striking sexual difference in the marking and coloration of the abdomen exhibited by this species is well shown in the plates; the difference in the appearance of the head in the two sexes, caused by the eyes meeting together in the males, which are consequently said to be "holoptic," is common to all Tabanidæ, as also to many other Diptera (compare Plates 11 and 26). Of *Tabanus autumnalis*, which in the South of England, according to Colonel Yerbury, is "one of the commonest species of the genus," the British Museum possesses nine modern British specimens (five males and four females), from the following localities:—N.E. Essex and Colchester, Essex, date of capture unknown, (*W. H. Harwood*); Felden, Boxmoor, Herts, July 17th, 1899 (*A. Piffard*); Harrow, Middlesex, July 15th, 1901 (*W. D. Lang*); Brockenhurst, New Forest, Hants, May 30th, 1896 (*Miss Gertrude Ricardo*); Dunster, Somerset, August 1st, 1902 *Lieut.-Colonel C. T. Bingham*; S. Devon,—Avon Valley, May 15th, 1896, Warleigh Marsh, June 24th, 1889, and Tamerton Folliott, June 29th, 1889 *Lieut.-Colonel Yerbury*). The Museum general collection contains specimens of this species from France, Portugal, Hungary, Italy, and Algeria. The localities given by Brauer (*loc. cit.*, p. 193) show that it

is found throughout Central and Southern Europe, from Sweden to Corsica and Corfu, while it also occurs in Asia Minor.

The eyes in *T. autumnalis* are without bands; Brauer describes those of the male as "black, iridescent, the large facets grey." As regards the dimensions of the British specimens in the Museum, the length of the males varies from 16 to 19 mm., that of the females from $16\frac{1}{2}$ to 20 mm.; the wing-expanse of the largest female is 38 mm.

Tabanus bromius, Linn.

Plate 23.

This species, as stated by Colonel Yerbury, is very common in the south of England; it is also the most easily recognised of the smaller species of *Tabanus*, since the large, conspicuous, and sharply defined yellowish spots on the abdomen give it quite a distinctive appearance. It is true that dark females of *Therioplectes montanus*, Mg., with little or no chestnut colour on the sides of the abdomen present a certain similarity to females of the present species, but they can, of course, at once be distinguished by the eyes being conspicuously hairy.

An examination of the British series of *Tabanus bromius* in the Museum collection shows that the males vary in length from $13\frac{1}{2}$ to 15 mm., while the length of the females ranges from $13\frac{1}{3}$ to 16 mm. The eyes of the male have an area of large facets in the upper half; those of the female are described by Brauer (*loc. cit.*, p. 188) as being "sometimes lighter, sometimes darker green, shimmering red"; in both sexes the eyes have a single purple band.

In England *Tabanus bromius* would appear to be on the wing from June to August; the localities and dates of the British specimens in the possession of the Museum are as follows:—Stockenchurch, Oxfordshire, August 15th—18th, 1896 (*Lieut.-Colonel Yerbury*); Oxshott, Surrey, June 16th, 1895 (*W. R. Ogilvie Grant*); Bearsted, Kent, July 26th, 1896 (*E. E. Green*); Crowborough, Sussex, July 10th, 1892 (*W. R. Ogilvie Grant*); Lyndhurst, New Forest, Hants, June 28th—July 21st (*Lieut.-Colonel Yerbury; F. C. Adams; F. W. Frohawk*);

Christchurch, Hants, July 1st, 1894 (*Lieut.-Colonel Yerbury*); various localities in S. Devon, June 24th—July 30th, 1889 (*Lieut.-Colonel Yerbury*).

Tabanus bromius is distributed throughout Europe; the Museum series (general collection) includes specimens from France, Switzerland, Italy, Hungary, and Corsica. As an instance of the abundance of this species in certain Continental localities, it may be mentioned that Brauer states that he once captured about one hundred specimens of *T. bromius* on a window near Liezen in Upper Styria.

Tabanus maculicornis, Ztt.

Plate 24.

In the marking of the abdomen the females of this species resemble those of the foregoing, though the spots are paler and often less sharply defined. Apart, however, from their usually smaller size and darker appearance, the females of *T. maculicornis* can at once be distinguished from those of *T. bromius* by the much greater width of the light-grey supra-occipital border of the head, behind the upper margin of the eyes. In the male sex also the abdominal markings are paler than in *T. bromius* (whitish instead of yellow), while the head is relatively much larger. According to Brauer (*loc. cit.*, pp. 197-198), the eyes of the male of *T. maculicornis* are "green, with a broad purple band at the junction of the different sized facets"; those of the female are described as "green, often with a coppery sheen, with a sometimes narrower, sometimes broader, purple band, which becomes less distinct towards the inner and outer margins." *Tabanus maculicornis* is, as a rule, distinctly the smallest of the British species of *Tabanus*, although small females of *T. cordiger*, Mg. (Plate 25), sometimes do not exceed large females of the present species in size. In the British series of *T. maculicornis* in the Museum collection the length of the males ranges from 11 to 13 mm., and that of the females from $11\frac{1}{2}$ to $13\frac{1}{4}$ mm. The time of flight appears to be June and July.

Colonel Yerbury notes that this species, like the foregoing, is

very common in the south of England. The modern British series belonging to the Museum at present consists of two males and eleven females from the following localities: Woolmer Forest, Hants, June, 1893 (*Colonel Irby*); Crabwood, Winchester, Hants, July 20th, 1893 (*L. C. Chawner*); Lyndhurst Road, New Forest, Hants, June 14th, 1894 (*Lieut.-Colonel Yerbury*); Fordingbridge, Hants, June 11th, 1897 (*Lieut.-Colonel Yerbury*); various localities in S. Devon, June 11th—July 4th (*Lieut.-Colonel Yerbury*). The Museum general collection includes specimens of *T. maculicornis* from Norway, Brittany, Germany, and Austria.

Tabanus cordiger, Mg.

Plate 25.

In this species also the head of the male is large, and strongly concavo-convex, with a conspicuous area of large facets in the upper half of each eye; the female may be recognised by the exceptionally broad front (space between the eyes), and by the shape of the shining black callus between the lower angles of the eyes, which is large and *square*, and occupies practically the whole width of the front. Brauer (*loc. cit*, pp. 201-202) describes the eyes of the male as "grey above, green in the lower fourth," with a dark transverse band between the large and small facets; the eyes of the female are stated to be unbanded. Two British males of this species are each $14\frac{1}{3}$ mm. in length; seven females measure from 13 to 15 mm.

According to Colonel Yerbury, *Tabanus cordiger* is "usually a rare insect, but occurs plentifully in the Abernethy Forest, Inverness-shire, in July and August." The British series in the Museum at present consists of two males and seven females, the localities and dates of which are as follows: Nethy Bridge, Inverness-shire, N.B., July 26th—29th, 1904 (*Lieut.-Colonel Yerbury*); Braemar, Aberdeenshire, N.B., July 22nd, 1873 (*G. H. Verrall*); Avon Valley, S. Devon, May 27th and 28th, and June 12th and 19th, 1896 (*Lieut.-Colonel Yerbury*); Walkham Valley, S. Devon, July 21st, 1889 (*Lieut.-Colonel Yerbury*). The Museum general collection includes specimens of this species

from Hungary, Corsica, Cyprus, and Biskra, Algeria. Additional localities given by Brauer show that it extends throughout Central and Southern Europe, and is also found in Asia Minor.

Tabanus glaucopis, Mg.

This species, of which the Museum at present possesses no British examples, resembles *Tabanus bromius*, but may be distinguished by the presence of a fairly broad and conspicuous yellow edging to the abdominal segments. The other abdominal markings are also yellower, and a further character for the recognition of the females is afforded by a conspicuous and rather broad median black callus on the front, above the callus between the lower angles of the eyes, with which it is not connected. The head of the male in shape and size is similar to that of the foregoing species; according to Brauer (*loc. cit.*, p. 199) the facets in the upper three-quarters of the eye are about four times larger than those in the lower quarter. The colour of the eyes of the male is described by Brauer as "grey, dark at the margin, green below, with a purple shimmer; in the lower fourth with three purple bands, the uppermost of which is divided towards its inner extremity." Brauer describes the eyes of the female as "green, red above towards the vertex and on the lower margin, in the centre with three curved and yellow-bordered purple bands." The length of the male is stated by Brauer as 16·5 mm., that of the female as from 16 to 18 mm. Nine Continental females in the Museum collection vary in length from $13\frac{3}{3}$ to 16 mm.

The geographical range of *Tabanus glaucopis* includes Central and Southern Europe. The Museum possesses specimens from Brittany the South of France, Spain, and the Tyrol.

GENUS

CHRYSOPS, Meigen.

Chrysops cæcutiens, Linn.

Plate 26.

The figures in the plate illustrate the striking sexual difference in the coloration and marking of the abdomen, which, though also seen in the case of *Chrysops quadrata* and *relicta*, is much more pronounced in the present species. It should be noted, however, that on the ventral surface of the abdomen of the male *C. cæcutiens* there is a yellow patch on each side, which frequently extends on to the upper surface and forms a more or less conspicuous ochraceous fleck on each side of the second segment. In life the eyes of this as of the other species of the genus are extremely beautiful, even when compared with those of other Tabanidæ, which as a family are distinguished for the beauty of their eyes; the ground-colour is golden or, reddish-green, and is marked with purple spots and lines.

Chrysops cæcutiens has been taken by Colonel Yerbury at Torcross S. Devon, as early as May 24th, and the Museum series of specimens shows that it is on the wing at any rate until the end of the first week in August. The dates and localities of the specimens are as follows :— Nairn, N.B., July 17th, 1904 (*Lieut.-Colonel Yerbury*); Oundle, Northants, July 16th, 1905 (*Hon. N. C. Rothschild*); Rugby, Warwickshire, July 3rd, 1890, July 10th, 1892 (*E. E. Austen*); Felden, Boxmoor, Herts, July 24th, 1893 (*A. Piffard*); Bearsted, Kent, July 10th, 1896 (*E. E. Green*); Fawkham, Kent, July 7th, 1895 (*W. E. de Winton*); Tilgate Forest, Sussex, August 3rd, 1890 (*E. E. Austen*); Woolmer Forest, Hants, August 7th, 1892 (*W. R. Ogilvie Grant*); Lyndhurst and Lyndhurst Road, New Forest, Hants, June 25th to July 12th, 1894 (*Lieut.-Colonel Yerbury*); various localities in S. Devon, May 24th to July 28th (*Lieut.-Colonel Yerbury*); Porthcawl, Glamorganshire, S. Wales, June 17th and 18th, 1903 (*Lieut.-Colonel Yerbury*).

In England, on the whole, this is probably the commonest species of its genus, although in some localities its place appears to be taken by *Chrysops relicta*. Colonel Yerbury writes that "the genus *Chrysops* does not seem to be plentiful in Scotland"; and he further adds that "*Chrysops* and *Hæmatopota* are silent or almost so in their approach; *Tabanus*, on the other hand, announces its arrival with a more or less loud hum." At Brockenhurst, in the New Forest, on July 14th, 1894, Colonel Yerbury captured a female of *Machimus atricapillus*, Fln. (a small Robber-fly), feeding on a male of the present species.

The geographical range of *Chrysops cæcutiens* extends throughout Europe to Siberia; the Continental series in the Museum includes specimens from France, Germany, Bohemia and Corsica.

Chrysops quadrata, Mg.

Plate 27.

In the male of this species the basal half of the abdomen shows a considerable amount of yellow at the sides, though the median quadrate black spot on the second segment, which is a continuation of the black area on the first, is very much larger than in the female, and nearly reaches the hind margin. As in the female, the hinder portion of the third segment, and sometimes that of the fourth as well, is conspicuously yellow. The median black spot on the second abdominal segment of the female is variable in shape as well as in size, being sometimes nearly square and sometimes more or less distinctly cordate. In the specimen illustrated it is connected with the blotch on the first segment, but more frequently it is separate.

Next to *Chrysops sepulchralis*, Fabr., *C. quadrata* is less often met with than any other of the British species of the genus. Colonel Yerbury writes that it is "as a rule rare, but is the common form in Denny Wait in the New Forest." The Museum series at present consists of one male and eight females, from the following localities:—Guestling, Hastings, Sussex, 1892 (*Rev. E. N. Bloomfield*); Lyndhurst and Lyndhurst Road, New Forest, Hants, July 3rd, 4th, and 21st;

August 14th,and September 1st, 1894 (*Lieut.-Colonel Yerbury*); Holne, Dartmoor, S. Devon, July 6th, 1896 (*Lieut.-Colonel Yerbury*).

Chrysops quadrata occurs on the Continent in Central and Southern Europe; the general collection includes specimens from France, Germany, Hungary, and Corsica.

Chrysops relicta, Mg.

Plate 28.

The width and shape of the black blotches on the second abdominal segment, as well as the sharply defined pale triangles and hind margins on the following segments afford a ready means for the distinction of the female of this species from that of *C. caecutiens*. In the specimen illustrated in the plate the blotches on the second segment are somewhat obscured by the wings, which are in the resting position. The markings of the male abdomen are similar to those of the female, but the sides of the basal portion are more tawny, and the pale triangles are much less distinct.

The Museum series of British specimens of this species, which as Colonel Yerbury remarks, is "common and generally distributed," is a fairly long one, and shows that it is on the wing from the latter end of May until at any rate the third week in August. The localities and dates of the specimens, which, unless otherwise stated, were taken and presented by Lieut.-Colonel Yerbury, are as follows:—Nairn, N.B., July 17th, 1904; Aviemore, Inverness-shire, N.B., July 7th and 9th, 1899, and August 15th, 1898; Rannoch, Perthshire, N.B., July 11th, 1898; Lyndhurst, New Forest, Hants, July 4th, 1894; Brockenhurst, New Forest, August 17th, 1893 (*W. R. Ogilvie Grant*); Torcross, S. Devon, May 24th to 26th, 1893; Porthcawl, Glamorganshire, S. Wales, June 25th, 1903; Leenane, Co. Galway, Ireland, July 14th, 1892 (*E. E. Austen*); Kenmare, Loo Bridge, and Parknasilla, Co. Kerry, Ireland, July 2nd to 15th, 1901.

The range of this species on the Continent includes Northern and Central Europe; the Continental series of *C. relicta* in the possession

of the Museum, although at present very limited, includes specimens from such widely distant localities as the North Cape, Norway, and the South of France.

Chrysops sepulcralis, Fabr.

This species was not known to be British until two males were taken on Studland Heath, near Swanage, Dorset, on August 3rd, 1895, by Captain Savile Reid, by whom they were presented to the British Museum (Natural History). No further specimens of *C. sepulcralis* have since been received by the Museum, but a female was taken on Parley Common, near Ringwood, Hants, on August 8th, 1904, by Mr. G. H. Verrall. *Chrysops sepulcralis*, which, in the British Islands, consequently appears to be decidedly rare and local, is a small species; the two males referred to above are $8\frac{1}{4}$ mm. in length, while a female from Germany measures only $7\frac{3}{4}$ mm. In this species the body is entirely black in both sexes, the outer margin of the dark transverse band across the wing is concave instead of, anteriorly at least, convex, and the face (except immediately beneath the base of the antennæ) is wholly shining, the facial and jowl-tubercles being confluent.

The geographical range of *Chrysops sepulcralis* includes Scandinavia, Germany, and Russia.

Family

MUSCIDÆ.

The three British blood-sucking species belonging to this Family are all nearly allied to the Common House-fly (*Musca domestica*, Linn.), but derive an even greater interest from their close relationship to the African Tsetse-flies (Genus *Glossina*), one species of which, *Glossina palpalis*, Rob.-Desv., is now widely known as the disseminator of the parasite which is the cause of the dread disease called sleeping sickness. In the Muscidæ, which, in the widest sense of the term are perhaps the largest of all the families of Diptera, the blood-sucking habit is highly exceptional and is confined to a very few genera and species, all of which in appearance present a general resemblance to the Common House-fly. In cases in which the blood-sucking habit occurs, it appears to be common to both sexes.

Blood-sucking Muscidæ, *with the exception of the Tsetse-flies*, breed in dung, depositing eggs from which are developed white maggots of the type of those of the Common Blow-fly (*Calliphora erythrocephala*, Mg.). According to Riley and Howard, *Lyperosia irritans*, Linn. (*Hæmatobia serrata*, Rob.-Desv.), (Plate 30, fig. 2), oviposits on fresh cow-dung, and its eggs are irregularly oval in shape, flattened on one side, and from 1·25 to 1·37 mm. in length, by 0·34 to 0·41 mm. in width. The newly-hatched larvæ descend into the dung, and eventually when full-grown attain a length of 7 mm. Pupation takes place in the ground beneath, at a depth of from half to three-quarters of an inch. The puparium is of the normal Muscid type, dark-brown in colour, barrel-shaped, and from 4 to 4·5 mm. in length by 2 to 2·5 mm. in width. *Stomoxys calcitrans*, Linn., breeds in horse-droppings, and its larvæ are very similar to those of the Common House-fly, which also breeds in horse-dung.

GENUS

STOMOXYS, Geoffroy.

Stomoxys calcitrans, Linn.

Plate 29.

The similarity in size between this species and the House-fly (*Musca domestica*, Linn.) sometimes causes *Stomoxys* to be mistaken for the latter, with the result that the House-fly is occasionally supposed to be capable of biting. Apart from points of difference afforded by markings, however, *Stomoxys*, not to mention other structural differences, can always be recognised by the little black, rigid piercing proboscis, which, as shown in the plate, when not in use projects horizontally in front of the head, whereas the fleshy, non-biting proboscis of the House-fly is normally carried drawn up into a cavity on the under side. The sexes of the present species can be distinguished by the front (space between the eyes) in the male being scarcely more than half the width of that in the female.

Stomoxys calcitrans, which is the only European species of its genus, and, like *Hæmatobia stimulans*, Mg. (Plate 30, Fig. 1), plagues both men and cattle, is common and generally distributed in the British Islands in summer and early autumn, and especially abundant in England in August and September, when it may often be seen sitting about in numbers on rails and gates in pasture-fields. The Museum series contains specimens from many different localities between and including the Southern Sutor, Cromarty, N.B., and South Devon. The dates of capture range from May 27th (Folkestone Kent) to October 3rd (Staines, Middlesex).

With reference to this and the following species (*Hæmatobia stimulans*, Mg.), Colonel Yerbury writes:—"These are common species in the Thames Valley; *S. calcitrans* was abundant, too, at Newmarket in October, 1905. The amount of pain produced by the bite of a Dipteron probably depends upon the idiosyncrasy of the person bitten; to the writer, however, the bite of these two

species causes far greater pain than that of any other fly." Writing in the 'Entomologist's Monthly Magazine,' Vol. II. (1865), pp. 142, 143, Mr. T. J. Bold gives instances of extraordinary virulence of the bite of *S. calcitrans* in the case of cattle and horses at Long Benton, Northumberland, in September, 1865. At one time a veterinary surgeon had fourteen cows under treatment for the bites. "The animals were generally bitten on the outside of the legs, on the shoulders, and, in rare cases, on the neck. In some of the severe cases the joints were so much swollen that the poor animals could not bend their legs to lie down, and in them the inflammation rose so high as to cause the loss of the outer skin and hair." The bites of the flies had no effect upon the hands of the veterinary surgeon attending the cows.

The geographical range of *Stomoxys calcitrans* has not yet been fully elucidated, but it is undoubtedly very wide. The species is generally distributed in Europe, and also occurs in North America, where it is said to be very common throughout the inhabited parts. A race of it is found in the Gambia Colony, West Africa, and it has also been recorded as occurring in Hong Kong, Batavia (Java), Ceylon, and Sydney (New South Wales). A specimen from the Naini Tal District, in Northern India, is indistinguishable from British examples.

Genus

HÆMATOBIA, Robineau-Desvoidy.

Hæmatobia stimulans, Mg.

Plate 30, Fig. 1.

In habits, time of occurrence, and extent of distribution in the British Islands this species agrees with the foregoing. In point of size *H. stimulans* occupies a position intermediate between *Stomoxys calcitrans* and the following species. The head in both sexes is very much smaller than in *S. calcitrans*, and the eyes in the male are

much closer together, being only narrowly separated. The palpi, which in *S. calcitrans* are exceedingly slender and short, and cannot be seen when the insect is viewed from above, in the present species are prominent and expanded at the tips, and, though still distinctly shorter than the proboscis, are apparently capable of forming a partial sheath for that organ.

The localities of the Museum series of specimens of this common species include the Northern Sutor, Cromarty, N.B., and Dartmoor, S. Devon; in addition to various places in the midland and southern counties of England, there are also specimens from Barmouth, N. Wales, and Kenmare, Co. Kerry, Ireland (*Lieut.-Colonel Yerbury*). The dates of capture range from May 5th to September 6th. For Colonel Yerbury's notes, see the previous species.

The Museum unfortunately possesses no specimens of *Hæmatobia stimulans* from localities outside the British Islands, but it is probable that on the Continent it is as widely distributed as *S. calcitrans*, although, so far as the writer is aware, it has not yet been recorded from any locality outside Europe. Zetterstedt states that it occurs throughout Scandinavia, but in Austria, according to Schiner, it is somewhat rare.

Genus

LYPEROSIA, Rondani.

Lyperosia irritans, Linn.

Plate 30, fig. 2.

In this species, which is by far the smallest of our native blood-sucking Muscidæ, the female measuring only from $4\frac{1}{4}$ to 5 mm. in length, the palpi, as in the Tsetse-flies (*Glossina*) are flattened from side to side and form a complete sheath for the proboscis, which they equal in length. *Lyperosia irritans* does not appear to attack human beings, but is a pest of cattle, on the backs of which it is found, showing, according to Zetterstedt, a preference for *black* animals; this latter

trait is in accordance with the well-known predilection of other blood-sucking Diptera, such as *Anopheles* and *Hæmatopota*, for resting upon dark surfaces. The localities and dates of the Museum series of specimens are as follows:—Felden, Boxmoor, Herts, September 5th, 1895 (*A. Piffard*); Lewes, Sussex, June 5th, 1870 (*G. H. Verrall*); Torcross, S. Devon, August 25th, 1903, and Porthcawl, Glamorganshire, S. Wales, May 31st, 1903 (*Lieut.-Colonel Yerbury*). Colonel Yerbury contributes the following note:—"In the British Isles this seems to be an uncommon insect. It has been caught on the backs of cattle at Barmouth (Merioneth), Porthcawl (Glamorganshire), and Torcross (S. Devon). These flies collect in numbers on the withers of young cattle, but are, as may be imagined, difficult to catch. The writer while catching them on the back of one beast got his net hung up on the horns of another, with disastrous consequences to the net. This, or a very closely allied species has the same habits in Ceylon, and was found in great numbers near Trincomali, on the backs of the village cattle."

The geographical range of *L. irritans* doubtless includes the whole of Europe, since it is known to extend from Central Scandinavia to Italy, where, according to Rondani, it attacks horses as well as cattle. The species has been introduced into the United States, where it is stated to have the habit of clustering in masses about the base and on the concave side of the horns of cattle, and has consequently been termed the "Horn-fly." First observed on cattle in New Jersey and Maryland in the summer and autumn of the year 1887, it is said to be now generally distributed throughout the United States and Eastern Canada. The Museum possesses a specimen from Vernon, British Columbia, where it was taken by Miss Ricardo on July 25th, 1902. The species is known to American writers by its synonym *Hæmatobia serrata*, Rob.-Desv.

Family

HIPPOBOSCIDÆ.

The strange-looking flies composing this Family are parasitic upon mammals and birds, and are probably descended from ancestors belonging to the Muscidæ, which underwent modification in bodily structure as a consequence of the adoption of a parasitic mode of life. The body in all cases is flattened and horny; the feet are provided with accessory claws to enable the insect to cling to the hair or feathers of the host; and while some of the forms, such as the Forest Fly (Plate 31), and *Ornithomyia avicularia*, Linn. (Plate 32) are fully-winged, others show a progressive reduction in this respect until in the "Sheep Tick" (*Melophagus ovinus*, Linn., Plate 34), the wings are wanting altogether. But even in fully-winged forms, since the flies are true parasites, the wings, as a rule, are made use of merely in order to reach the host, or, in the case of the males, in order to find an individual of the opposite sex, and thereafter it is only in exceptional circumstances, such as the death of the host, or too active pursuit by the human hand, or when taking a short flight from one animal to another, that these flies are ever seen upon the wing. The proboscis in the Hippoboscidæ is curved, extremely slender, and protrusible, but is composed of the same parts as that of the blood-sucking Muscidæ. In appearance it presents a decided resemblance to the proboscis of the Tsetse-flies, and it also acts in the same way as the latter, its tip being armed with sharp chitinous teeth which enable the organ to pierce the skin of the host. Another point of resemblance to the Tsetse-flies is to be found in the mode of reproduction, which is a further development of the process seen in the flies referred to, and has caused the Hippoboscidæ and certain other families of parasitic Diptera belonging to the same group to receive the name *Pupipara*. In these forms, namely, the pregnant female does not lay eggs, but produces at each birth a full-grown larva, which assumes the pupal state immediately after extrusion.

In addition to those figured in Plates 31 to 34, the fauna of the

British Islands includes two other species of Hippoboscidæ, *Stenopteryx hirundinis*, Linn., and *Oxypterum pallidum*, Leach, found respectively on and in the nests of the house martin (*Chelidon urbica*, Linn.), and the swift (*Cypselus apus*, Linn.).

It is doubtful whether an authentic instance exists in which any species of Hippoboscidæ has sucked human blood under natural conditions, though the flies sometimes stray on to human beings when their hosts are interfered with.

Genus

HIPPOBOSCA, Linnæus.

Hippobosca equina, Linn.—The Forest Fly.

Plate 31.

The upper figure shows the resting position.

As indicated by the English name, the principal home of this species in the British Islands is the New Forest, in Hampshire, where it may often be seen in clusters like bees, sometimes numbering many hundreds, on the ponies and cattle which run wild there. The flies chiefly congregate on parts where the skin is thinnest, beneath the tail, on the perinæum, and on the inner surface of the thighs. The bite does not seem to cause pain, and animals bred in the Forest take no notice of the fly, but strange horses and especially donkeys are sometimes driven almost frantic by the irritation caused by a single Forest Fly crawling over them. The toothed claws enable the fly to cling so tightly to the hair that it is impossible for an animal to dislodge it by a brush from its tail, and the quick and somewhat crab-like movements of the insect, which when disturbed usually moves sideways, tickle the host and are exceedingly irritating to sensitive animals.

Forest flies are to be found from the beginning of May until at least the second week in October. In addition to the New Forest the species

occurs in Dorsetshire, and apparently throughout Wales, since the Museum possesses specimens from Glynybedd, Cadoxton juxta-Neath, Glamorganshire, S. Wales, October 11th, 1898 (*Dr. D. Thomas*: on cattle), and others from Beddgelert Valley, Carnarvonshire, N. Wales, July, 1901 (*O. Peters*: also on cattle). From Dorsetshire there are specimens from Corfe Castle, June and July 14th, 1897 (*E. R. Bankes*), and Bonsley Down, near Blandford, September 25th, 1895 (the late *J. C. Mansel-Pleydell*). In the latter neighbourhood the insect proved troublesome to the army horses engaged in the Autumn Manœuvres of 1872.

The Forest Fly occurs throughout Europe and in very many other widely distant localities, to some of which, at any rate, it has doubtless been carried with horses in recent years. The Museum collection includes specimens of the species from,—Algeria; the Cape of Good Hope; Madeira; Canary Is.; St. Michael's, Azores; Trebizond, Turkey in Asia; Bengal; Upper Burma; Celebes; Fiji; and New Caledonia.

Genus

ORNITHOMYIA, Latreille.

Ornithomyia avicularia, Linn.

Plate 32.

This species, which is a bird-parasite, is, as might be expected generally distributed throughout the British Islands. The localities of the Museum series of specimens range from the Shetland Islands to Dorset, and include S. Wales and Co. Wicklow, Ireland. The birds from which the flies were obtained were as follows:—pheasant, partridge, red grouse, blackcock, snipe, long-eared owl, barn owl, green woodpecker, thrush, blackbird, wheatear, white-throat, red-backed shrike, and starling. The flies frequently occur singly, but sometimes a male and female, or even as many as three specimens, are found on the same bird. If a bird infested by one of these insects be shot, the parasite will sometimes take wing and fly with great pertinacity

round and round the person carrying the bird. Males which have, perhaps, gone astray while seeking a female are occasionally met with; thus at Brockenhurst, in the New Forest, on May 26th, 1894, a male was caught on the wing by Mr. C. O. Waterhouse; and the Museum collection also contains another male, taken by Colonel Yerbury, at Portheawl, Glamorganshire, S. Wales, on July 1st, 1903, on a hotel window. This species shows great individual variation in size, as also in coloration; freshly caught or living individuals are often quite green.

Ornithomyia avicularia appears to have been carried by birds all over the world; the Museum possesses specimens from, among other localities, Tristan d'Acunha I., in the South Atlantic; Launceston, Tasmania; and New Zealand. The species also occurs in New South Wales, where, as also in Tasmania, it exhibits a remarkable change of habit, since it is parasitic on the kangaroos known as wallabies (*Halmaturus ruficollis*, Desm., and *H. parryi*, Benn).

Genus

LIPOPTENA, Nitzsch.

Lipoptena cervi, Linn.

Plate 33, male: Plate 34, fig. 1, female.

This species is parasitic upon several species of deer, including the roe, red, and fallow deer, and also, in Scandinavia, upon the elk (*Alces alces*, Linn.); in Great Britain its chief host is the roe (*Caprolus caprolus*, Linn.). On emerging from the pupa both sexes possess wings, which, in the case of the female at any rate, as soon as the insects reach the host appear to break off close to the base, leaving stumps as shown in Plate 34, fig. 1. Specimens of both sexes found upon a roe are usually in this wingless condition, in which they often present a superficial resemblance to the "Sheep Tick" (*Melophagus ovinus*, Linn.—Plate 34, fig. 2), though they can easily be distinguished by the possession of wing-stumps. In the autumn months,

however, winged males are sometimes met with in woods inhabited by roe-deer; these differ considerably in appearance from the apterous males found in company with females among the hair of the host, being paler in colour and more slender in the abdomen, while the males that have lost their wings are more like the females, and are darker in colour with a broader and stouter abdomen. Winged individuals of both sexes have been caught flying round a dead roe, but the females all shed their wings in dying; the Museum collection contains a number of males with wings, but not a single winged female.

With two exceptions all the specimens of this species in the Museum series were taken on roe deer at Whatcombe, Blandford Dorset, between September 19th and October 26th, 1895, and presented by the late Mr. J. C. Mansel-Pleydell. Besides these there are also a male from the same locality, taken on October 17th, 1895, on a horse after passing through hazel-bushes in Houghton Wood, which is frequented by roe deer (*J. C. Mansel-Pleydell*); and another male from Stoke Edith, Herefordshire, caught by Colonel Yerbury, on October 11th, 1897, on his own neck, after passing through Stoke Edith Park, in which there are fallow deer. A winged male figured by Curtis ('British Entomology,' 1824) under the name *Hæmobora pallipes*, is said to have been taken in the New Forest, Hants, about the middle of September, 1822, on the clothes of a Mr. J. Chant.

Lipoptena cervi doubtless occurs throughout Europe, and closely allied species are found in other parts of the world. In February, 1901, a specimen of *L. cervi* was taken by Mr. P. S. Stammwitz, near Johannesburg, Transvaal, under circumstances pointing to the possibility that it had been introduced into South Africa with remounts during the South African War.

GENUS

MELOPHAGUS, Latreille.

Melophagus ovinus, Linn.

The Sheep "Tick," Sheep "Louse," or Ked.

Plate 34, Fig. 2.

A higher degree of adaptation to a parasitic existence is exhibited by this species than by any of the foregoing members of the Family to which it belongs, since the wings are always entirely wanting in both sexes. This peculiarity, coupled with the general strangeness of its appearance, which presents little resemblance to an ordinary fly, and the fact that it passes its whole life-cycle in the wool of the sheep, has gained for the insect two of the popular names mentioned above. The late Miss Ormerod ('Report of the Observations of Injurious Insects and Common Farm Pests, during the year 1895' (London: Simpkin, Marshall, Hamilton, Kent & Co., Ltd., 1896), p. 120) states that "when seen in the wool" Sheep Ticks "greatly resemble small spiders," though, of course, the presence of only three pairs of legs is sufficient to show that the creatures must be insects. The Sheep Tick does not possess the activity of the Forest Fly, but moves quite slowly and quietly through the wool of the host, to which, when not in excessive numbers, it may cause little annoyance. Dr. Parry, however (quoted by Youatt in 'The Mountain Shepherd's Manual' (1862), p. 35), says that *Melophagus ovinus* "is extremely injurious to sheep, by making the animal bite and rub itself, so as not only to hurt the fleece, but to break the skin, in consequence of which the fly [*Lucilia sericata*, Mg.] is apt to fix on the wool near the wounded spot and there deposit its eggs."

The Sheep Ticks in the Museum collection were taken during May and June, *i.e.*, at shearing-time, but Curtis believes that the insect is to

be found all the year round, since he had received specimens as early as March.

Like the Sheep Bot-fly (*Œstrus ovis*, Linn.) the Sheep Tick has been carried about the world with its host. Recently the Museum has received a series of specimens of this species (with pupa-cases) from Pecos Cañon, New Mexico, taken and presented by Dr. M. Grabham, in June, 1903.

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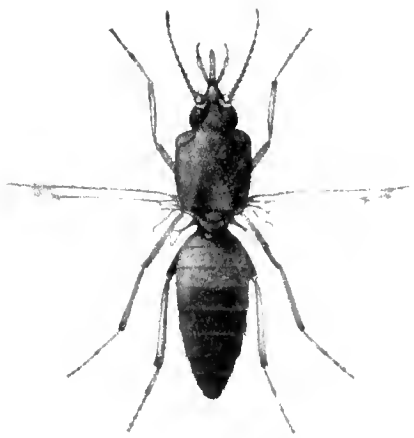


FIG. 1. Ceratopogon varius (Female)

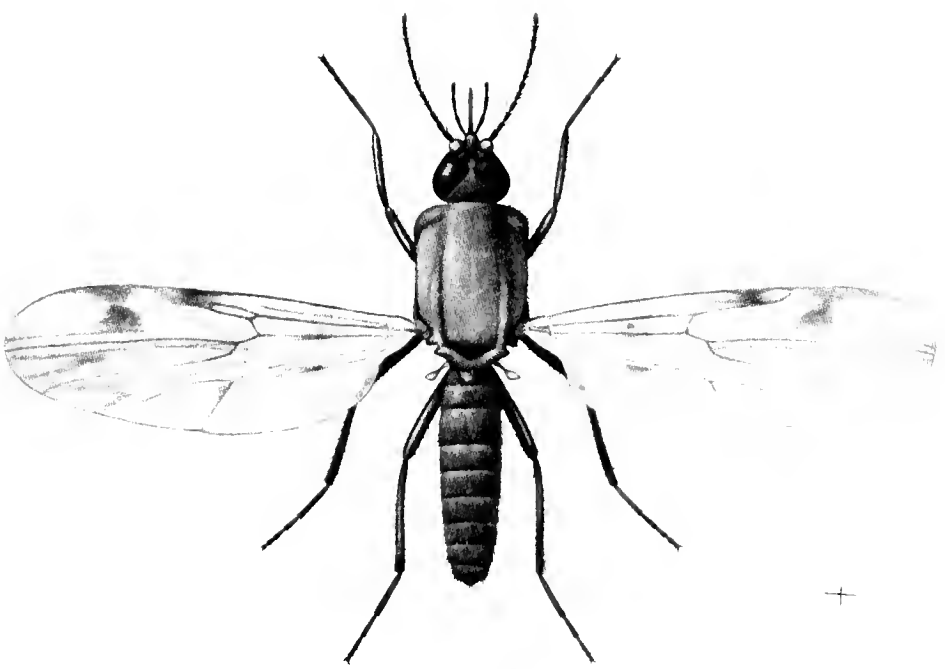
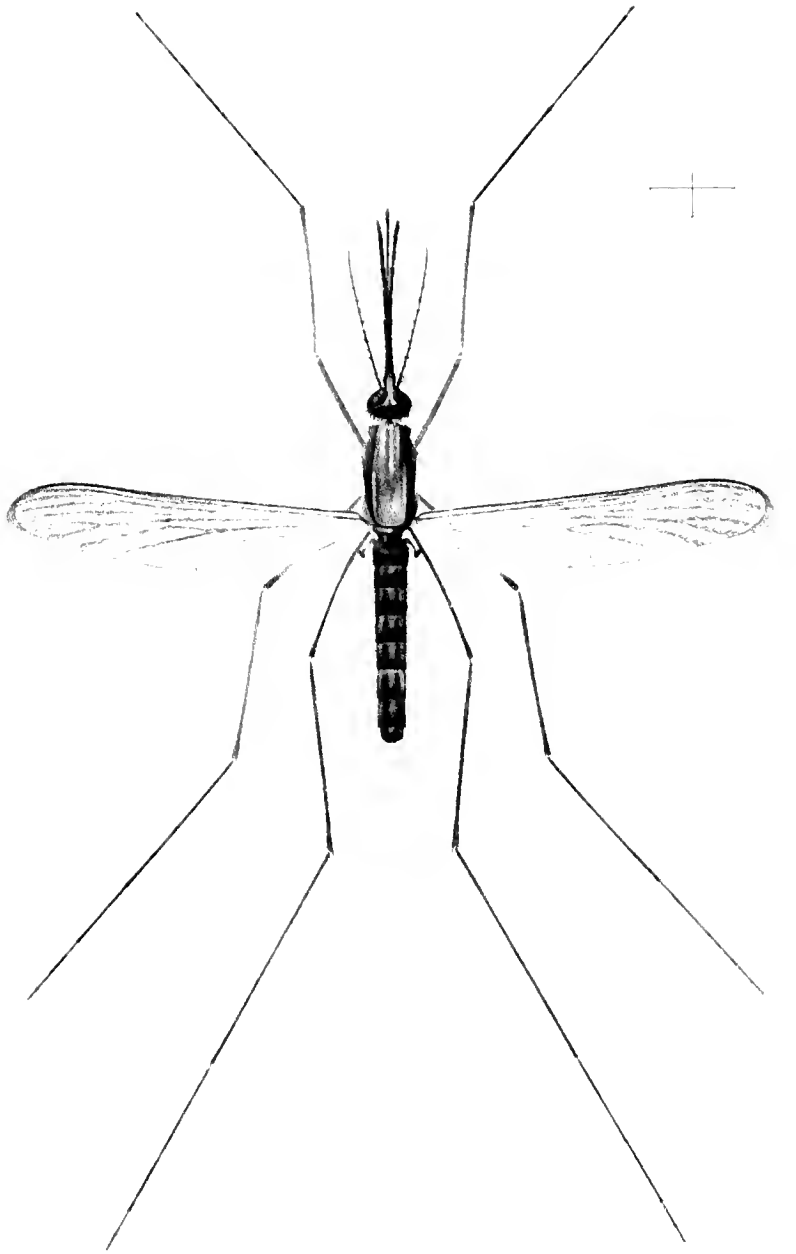
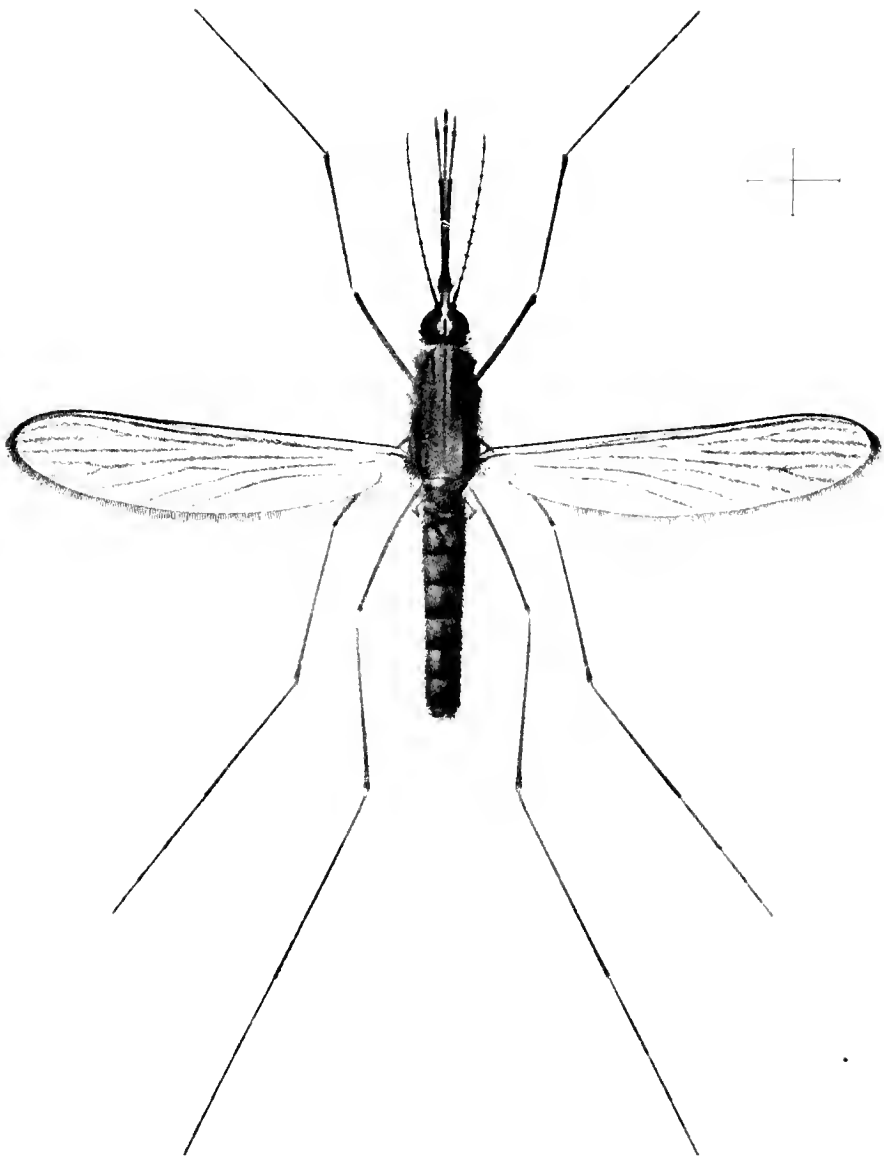


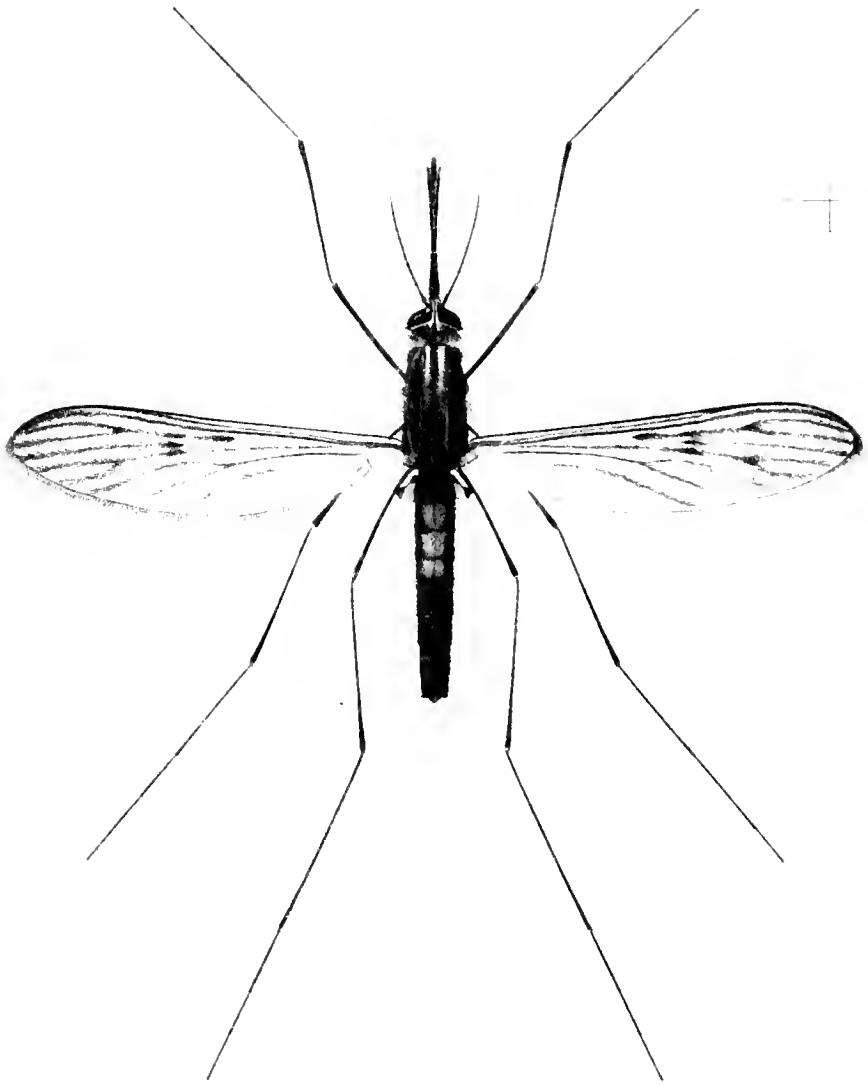
FIG. 2. Ceratopogon pulicaris (Female)



Anopheles nigripes (Female)

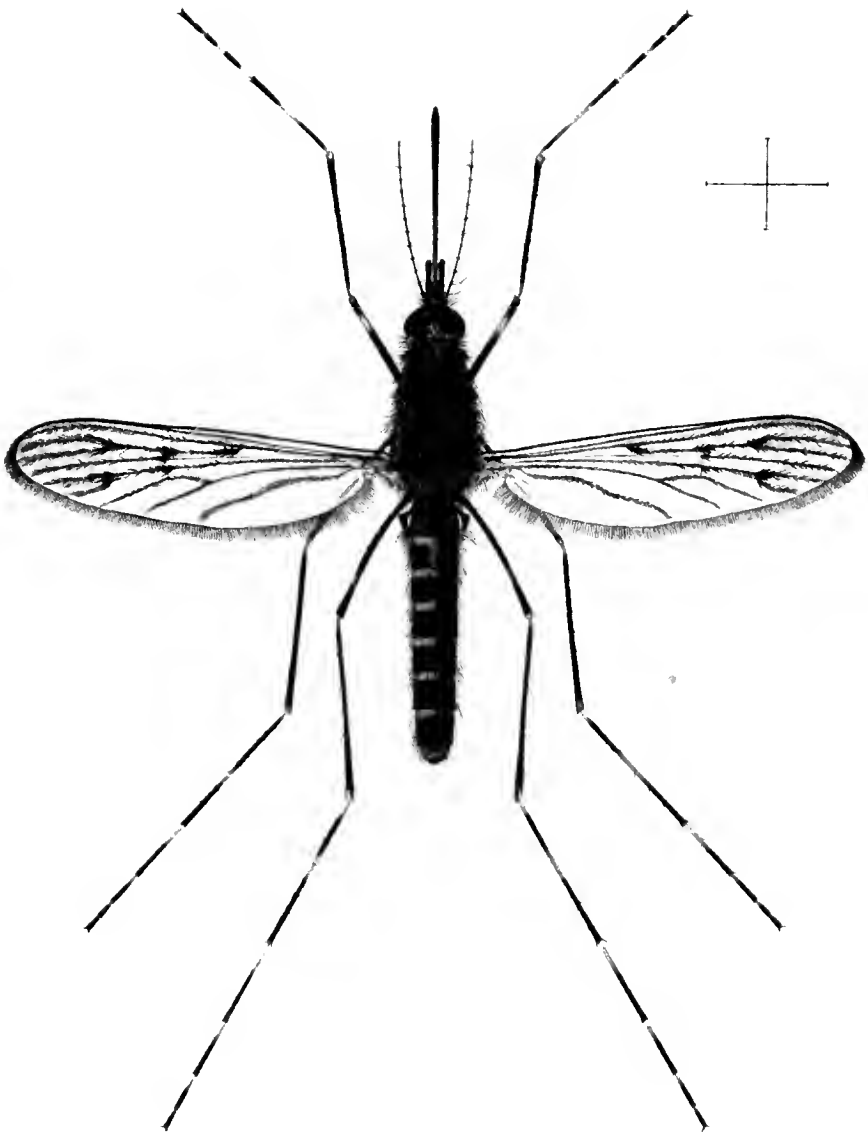


Anopheles bifurcatus (Female)

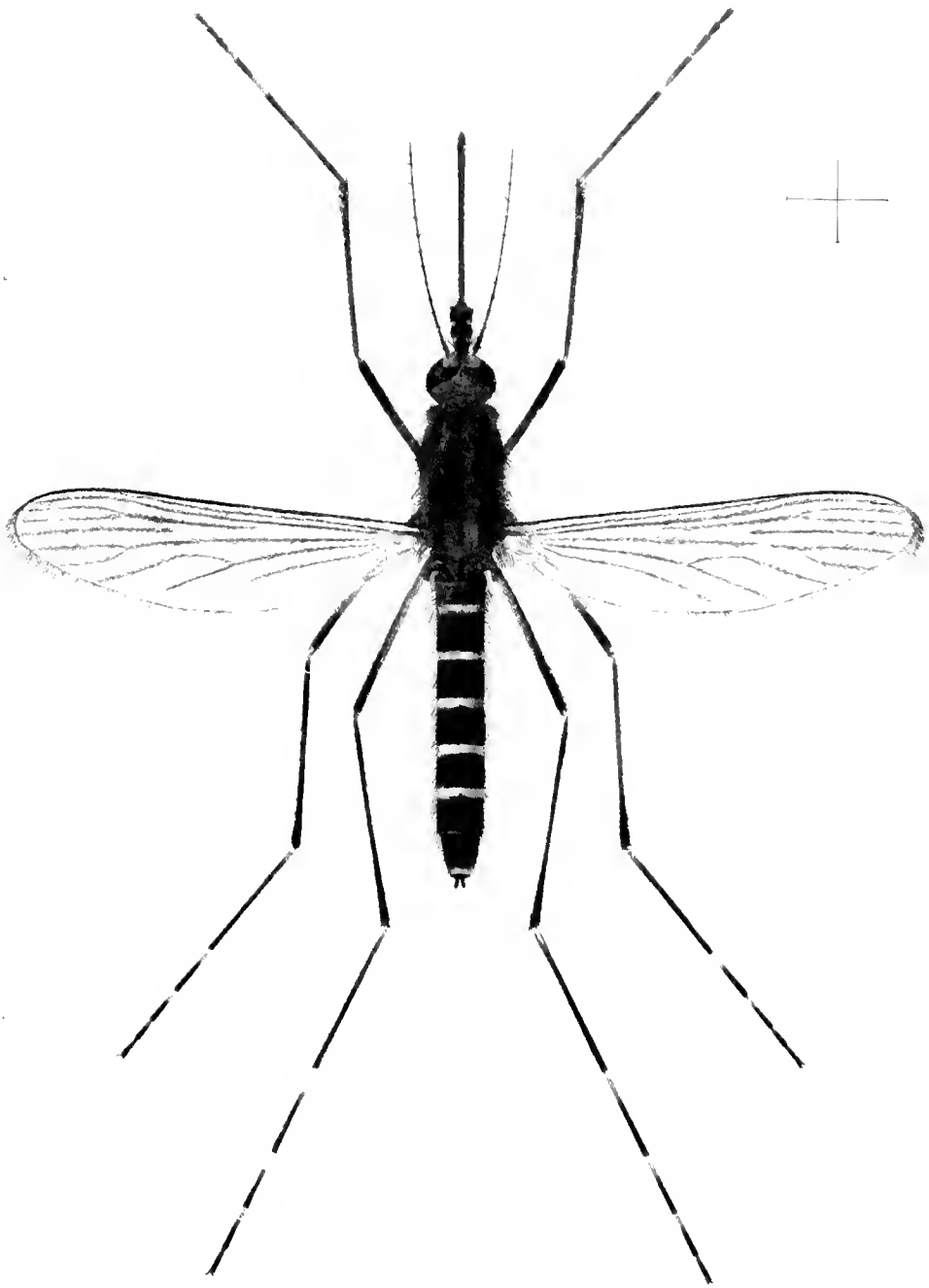


Anopheles maculipennis (Female)

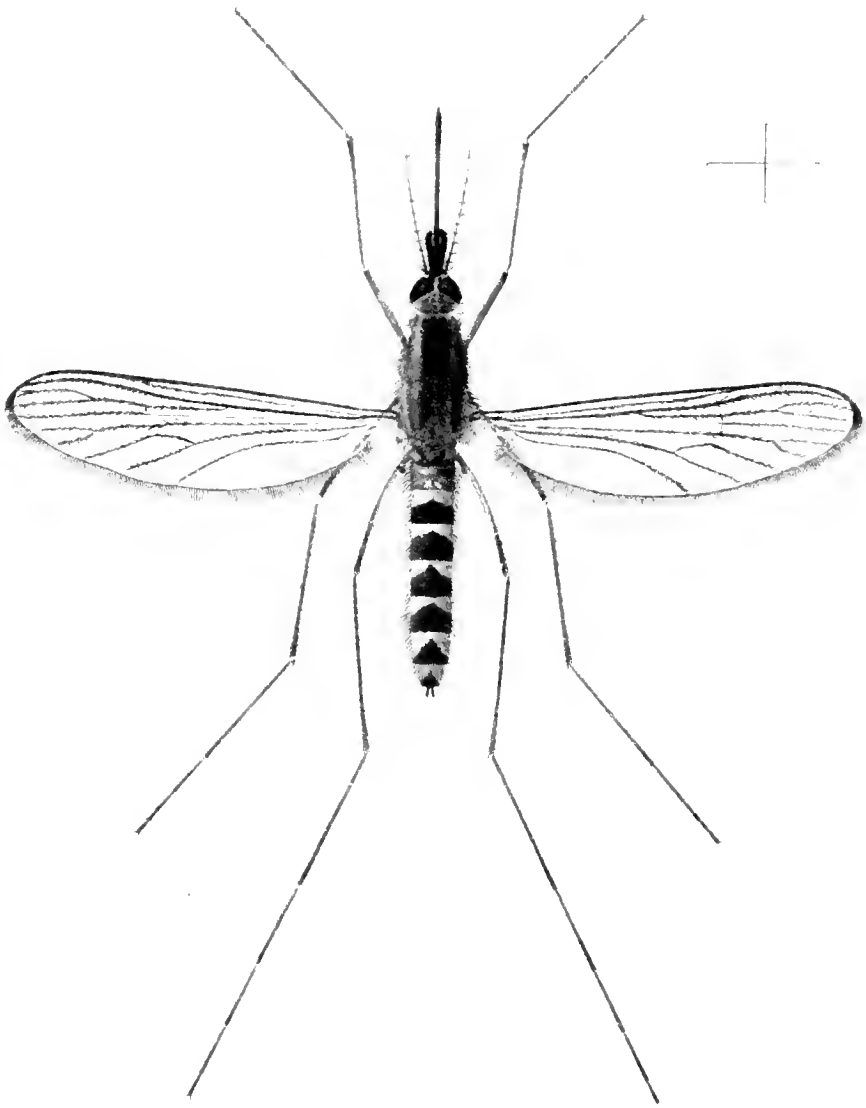
THE SPOTTED GNAT



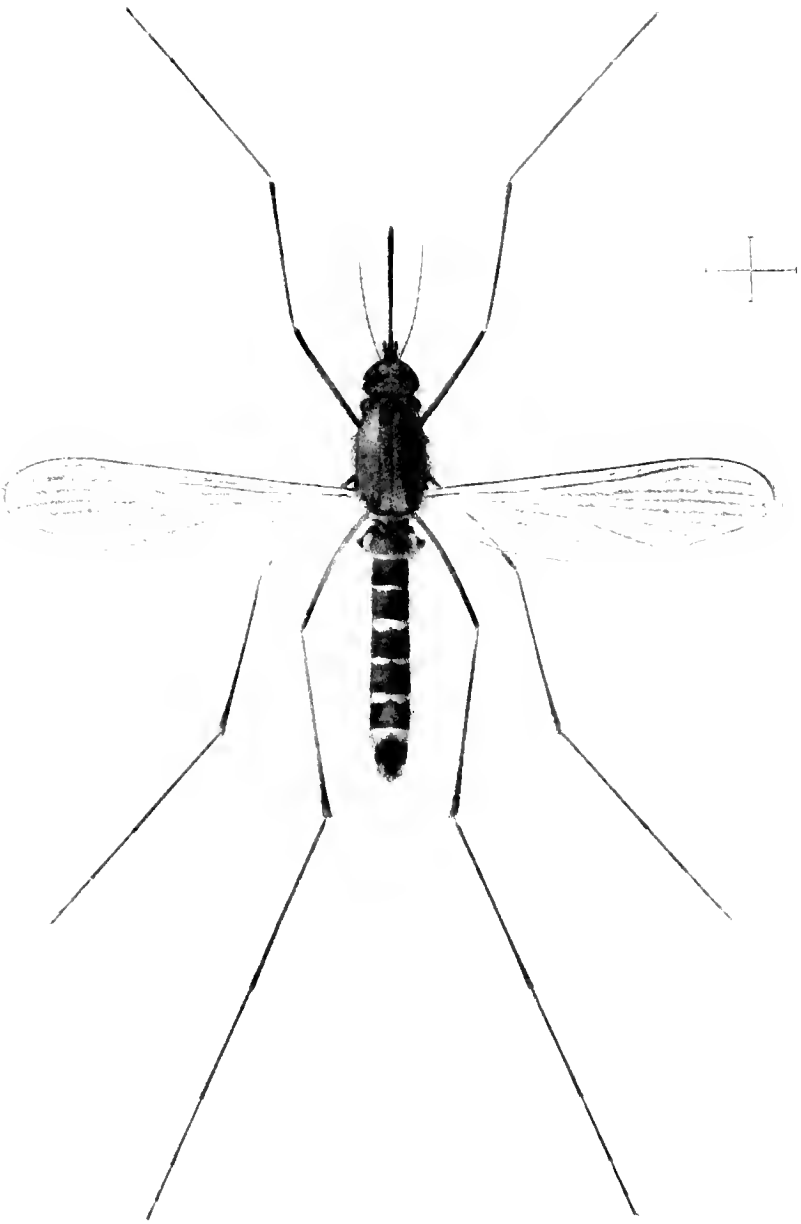
Theobaldia annulata (Female)



Culex cantans (Female

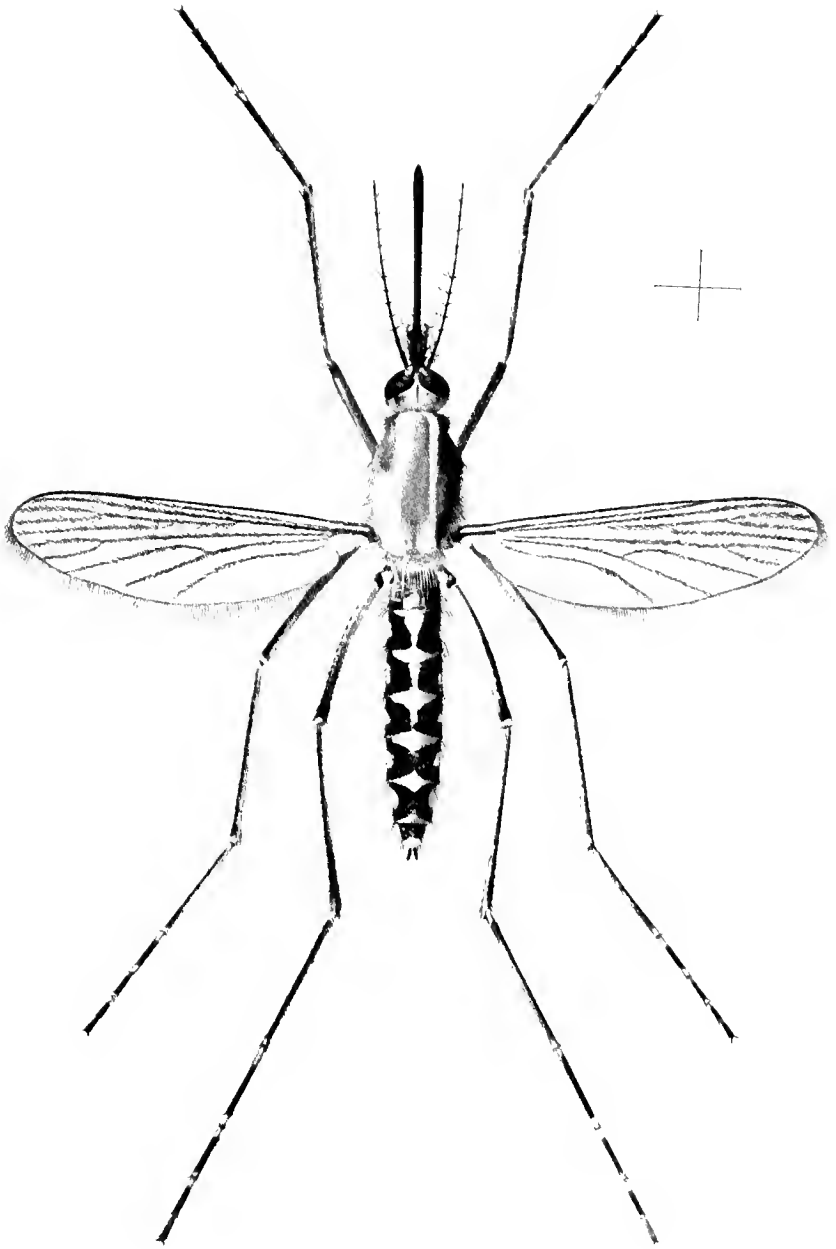


Culex nemorosus (Female)

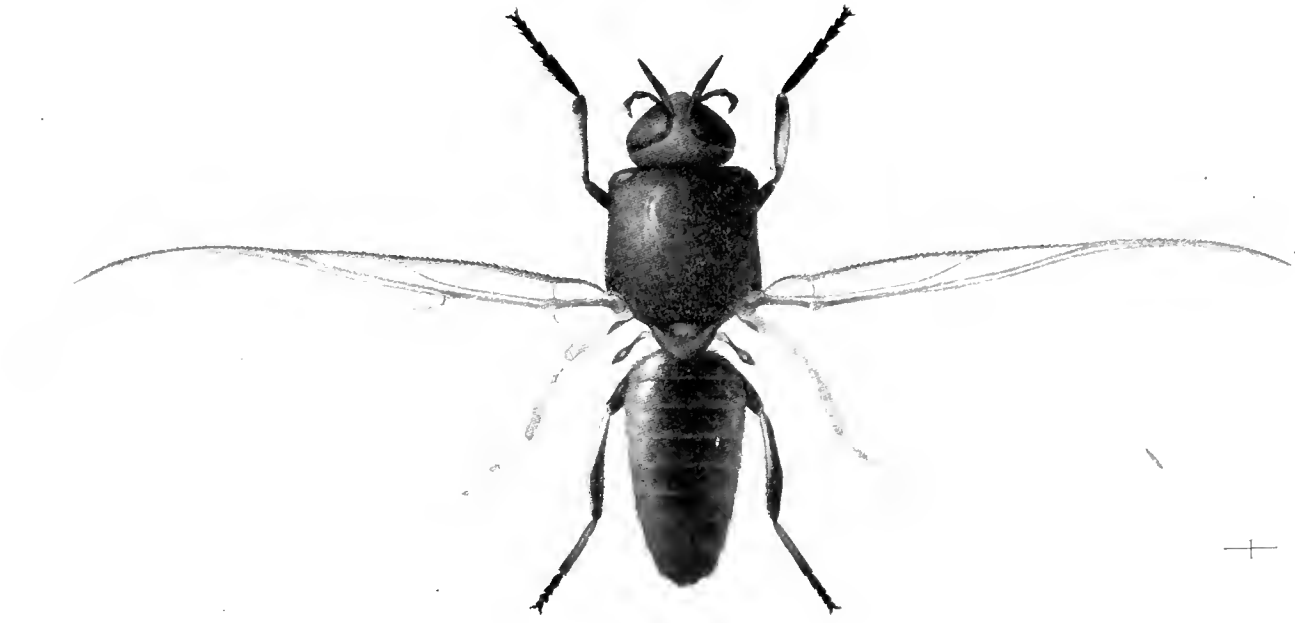


Culex pipiens (Female)

THE COMMON GNAT



Grabhamia dorsalis (Female)

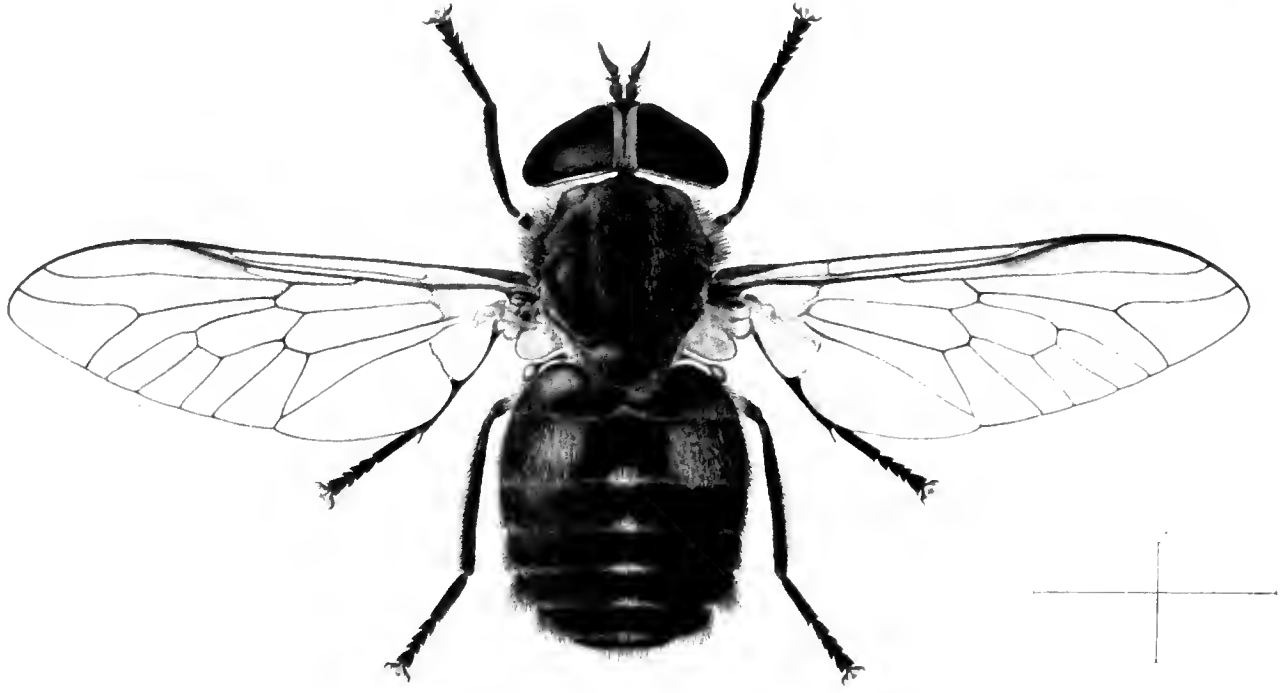


Simulium reptans (Female)

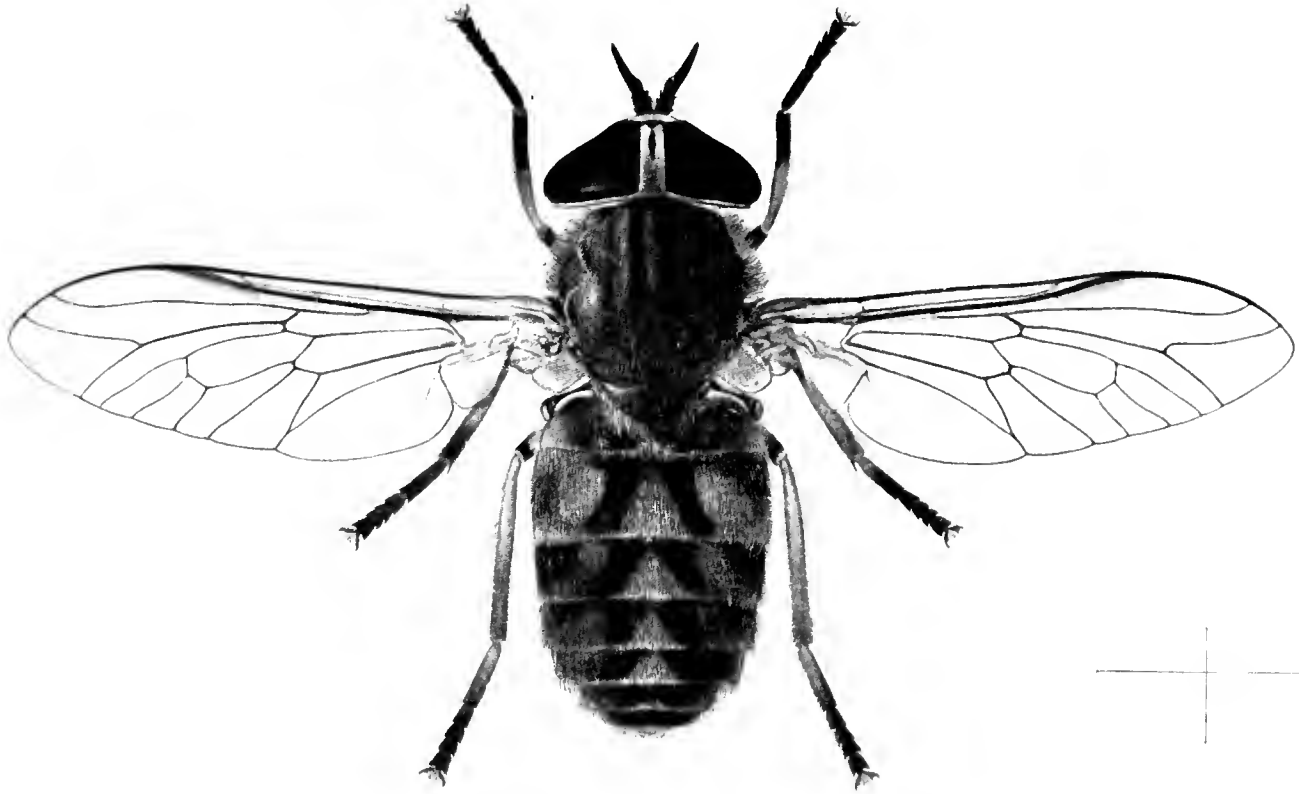
FIG. 1. Haematopota pluvialis (Male)

FIG. 2. Haematopota pluvialis (Female)

Haematopota crassicornis (Female)

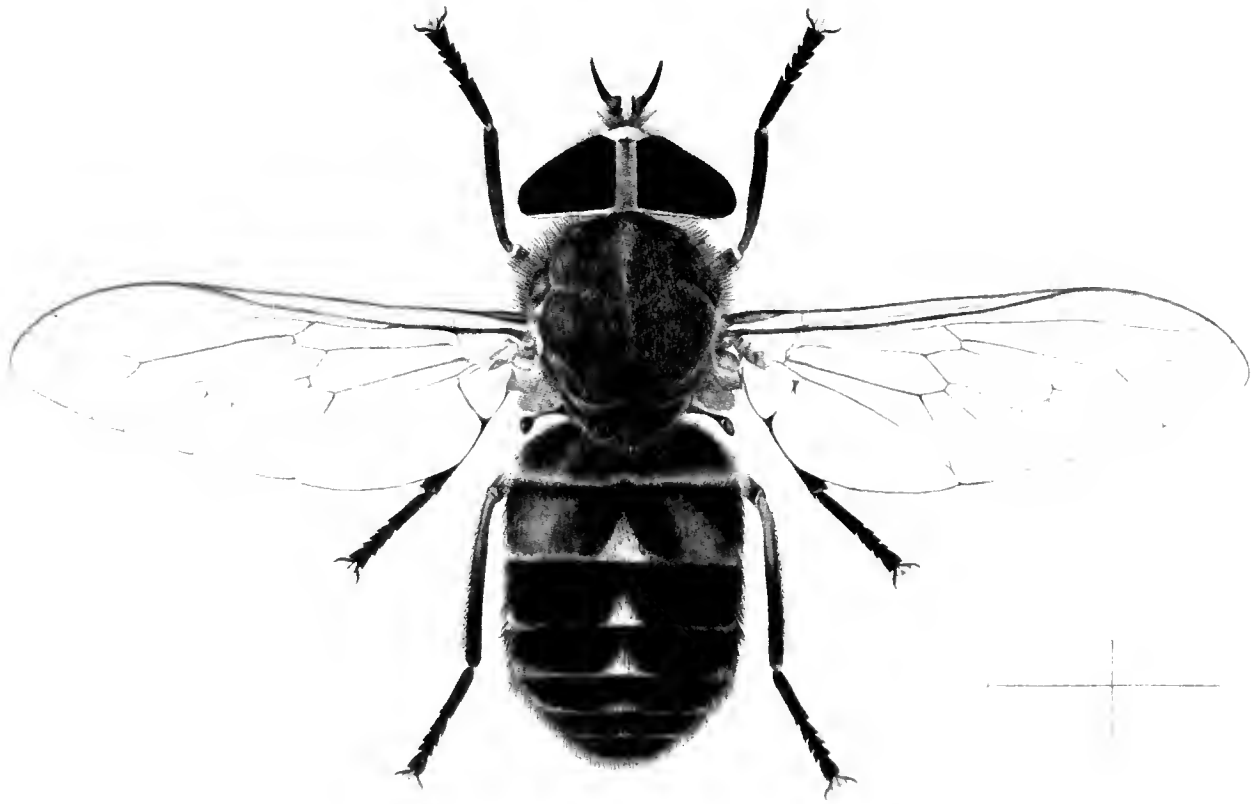


Therioplectes micans (Female)

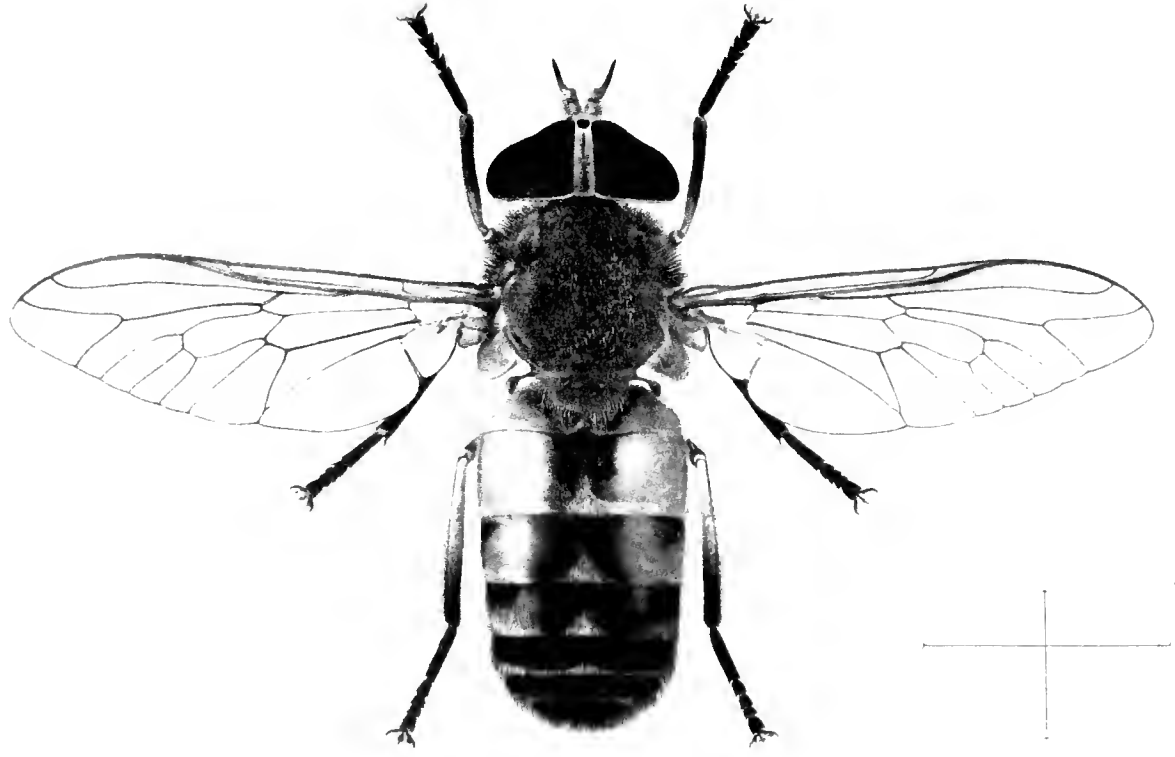


Therioplectes montanus (Female)

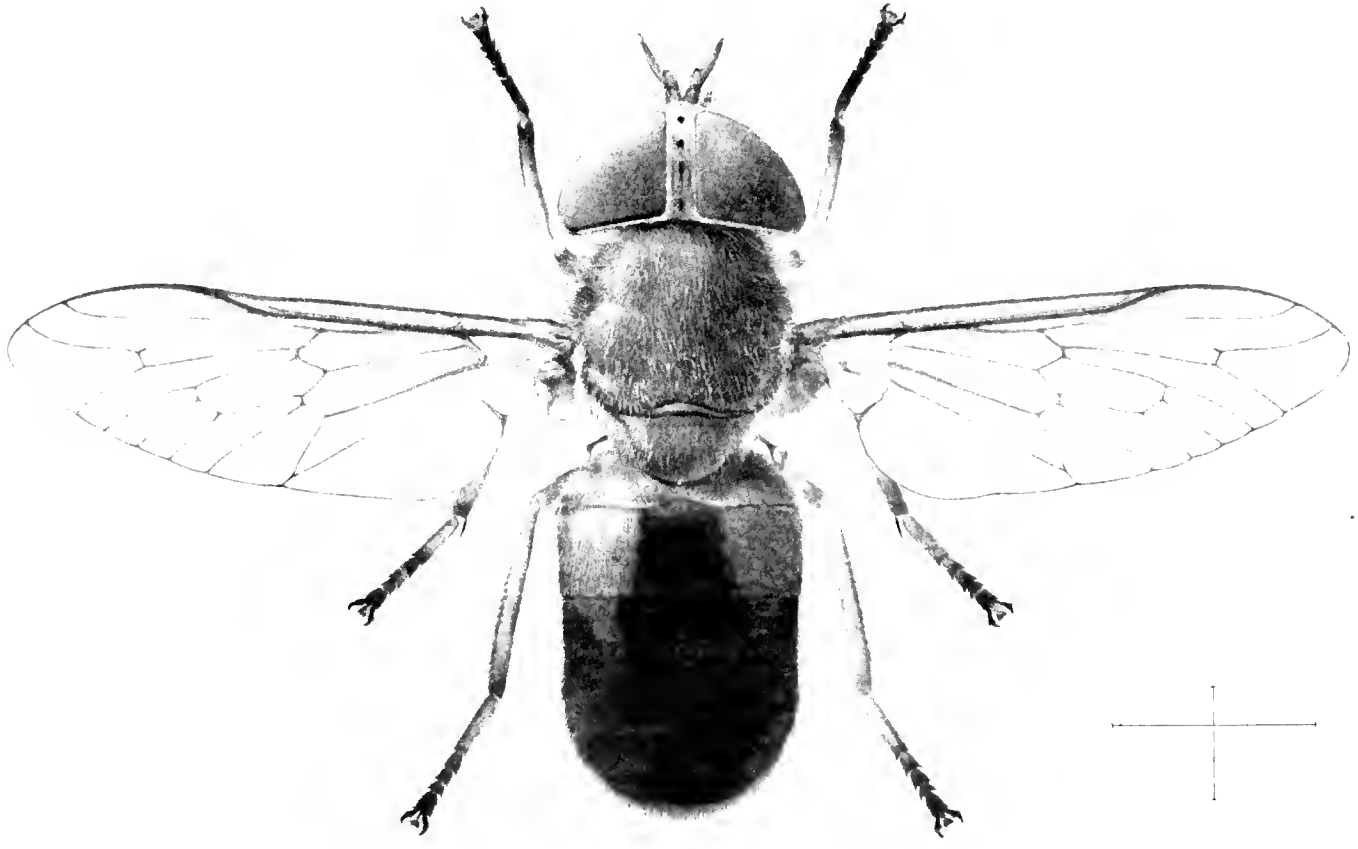
Therioplectes luridus ♀ Female



Therioplectes tropicus *form* bisignatus (Female

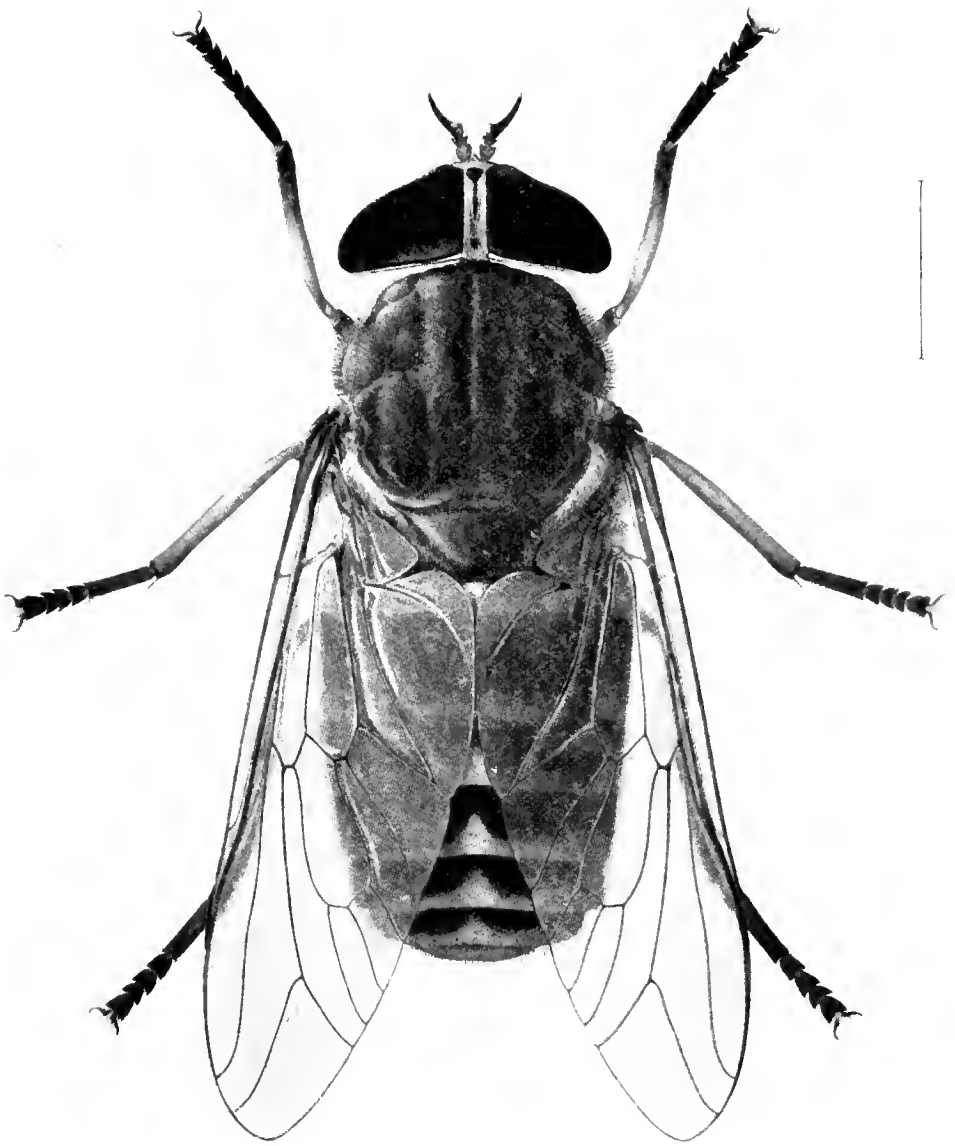


Therioplectes solstitialis (Female)

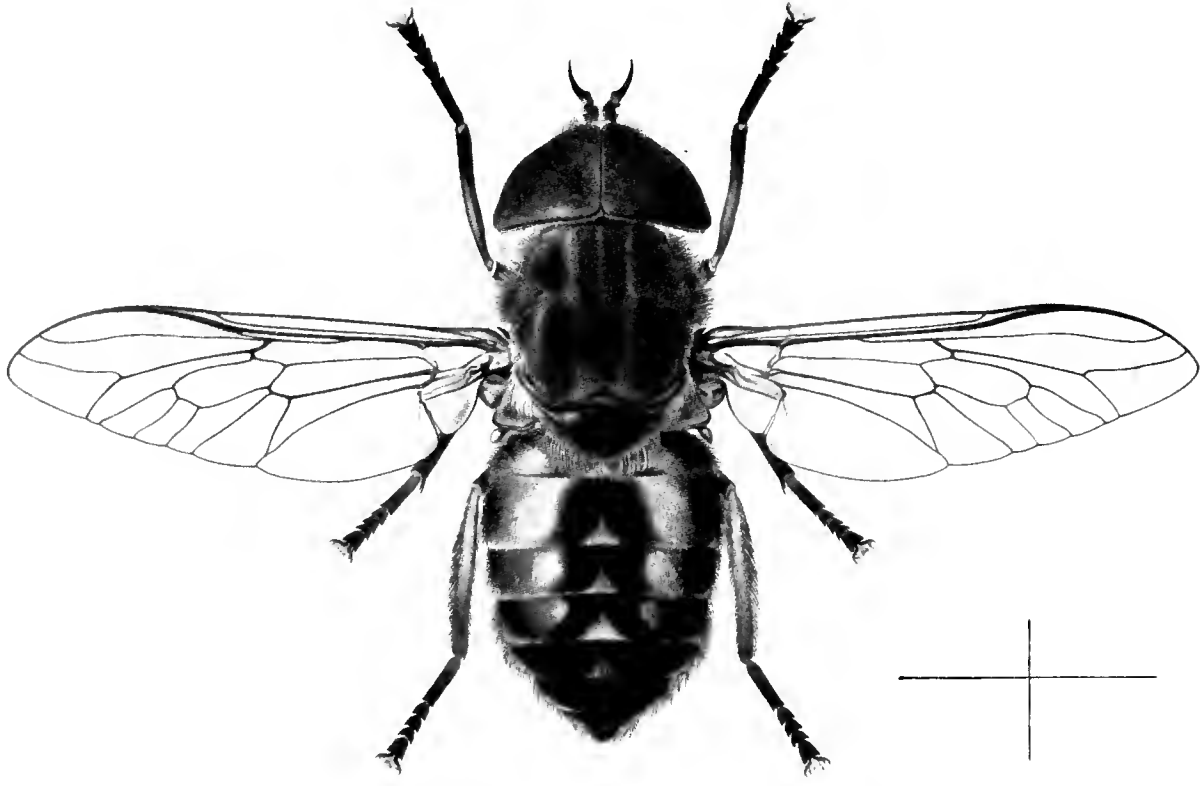


Atylotus fulvus (Female)

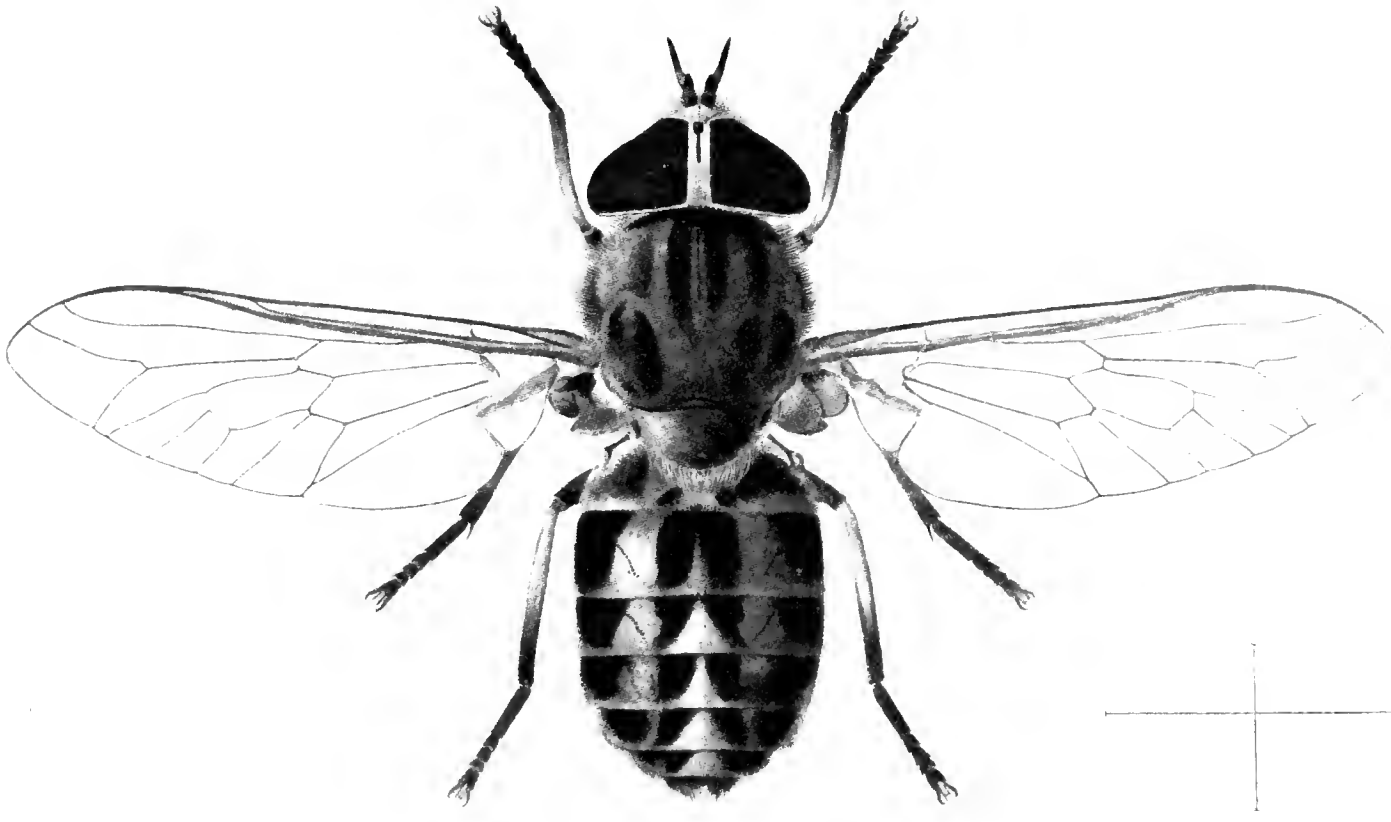
Tabanus bovinus (Female)



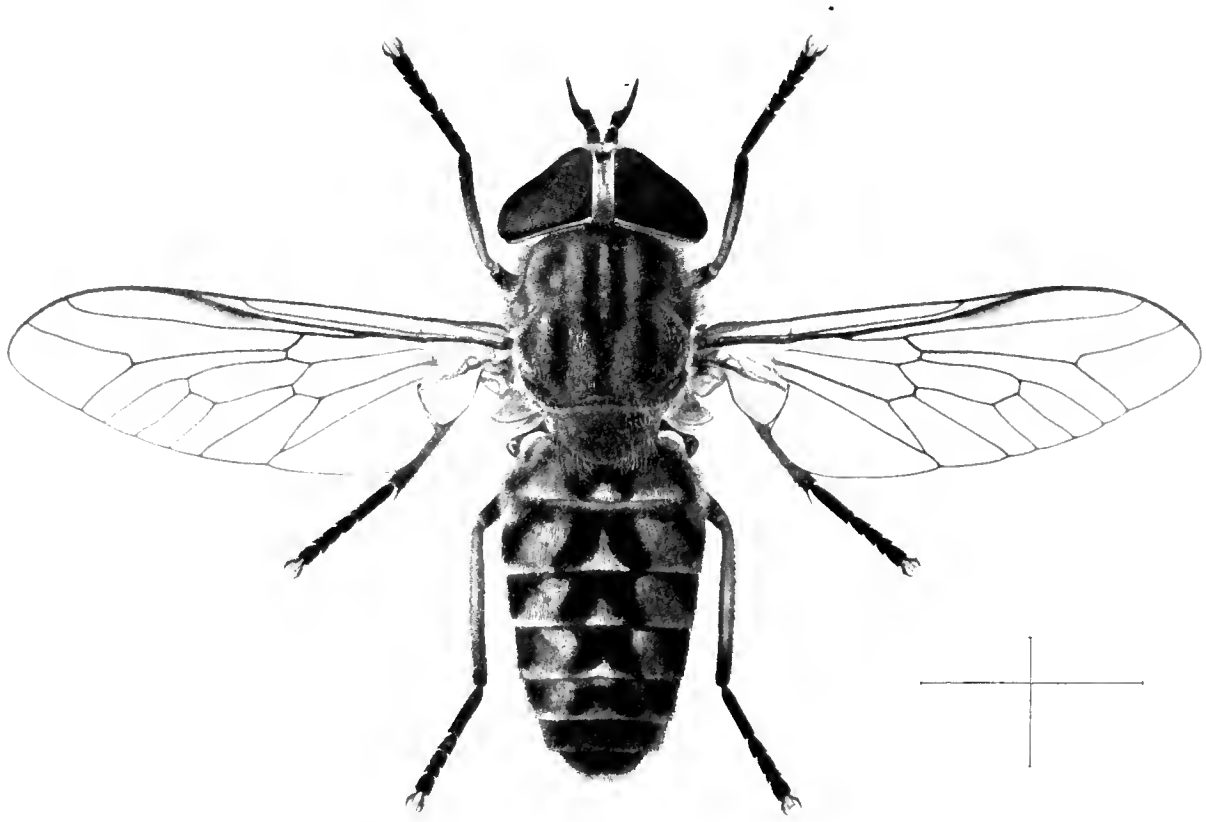
Tabanus sudeticus (Female)



Tabanus autumnalis Male



Tabanus autumnalis (Female)



Tabanus bromius (Female)

Tabanus maculicornis (Female)

Tabanus cordiger (Female

FIG. 1. Chrysops caecutiens (Male)

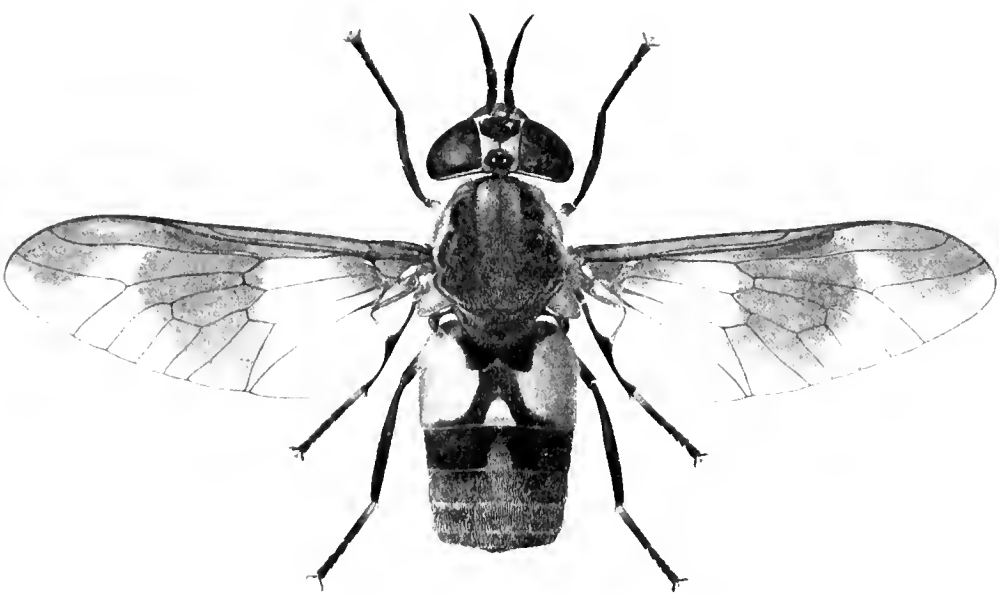
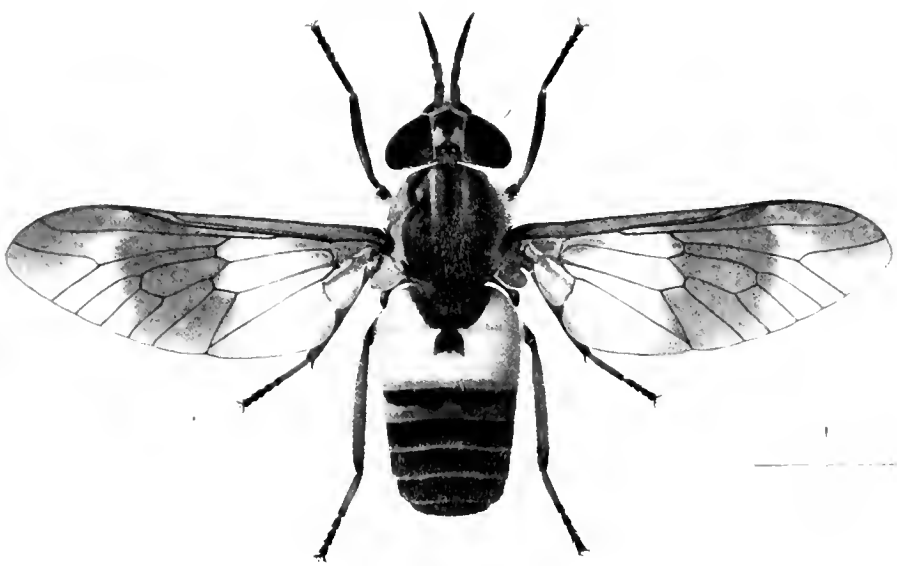
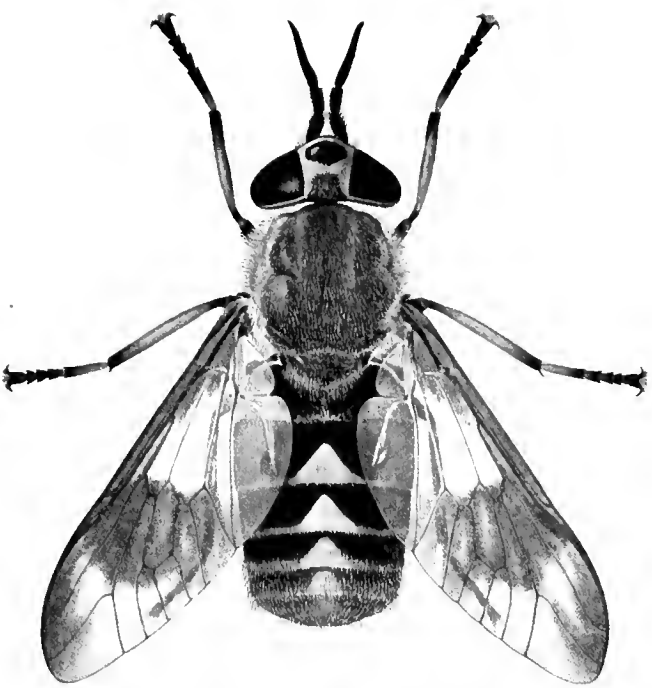


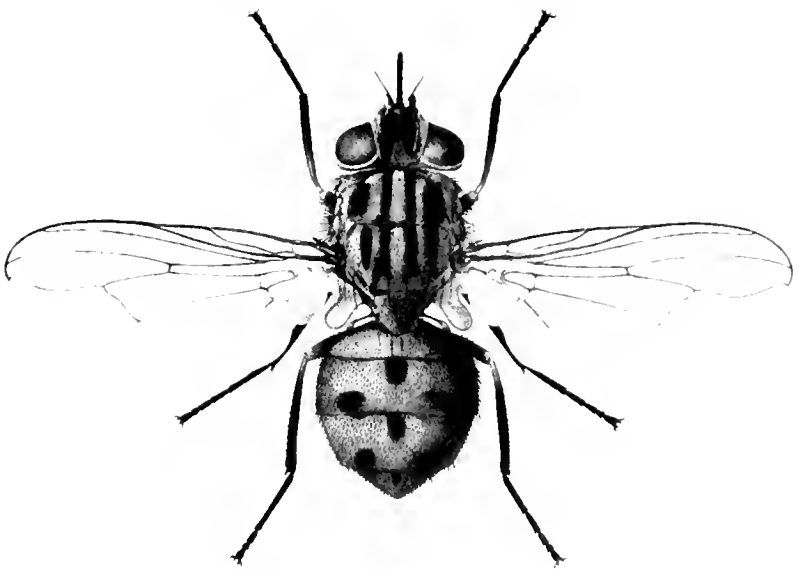
FIG. 2. Chrysops caecutiens (Female)



Chrysops quadrata (Female)



Chrysops relicta (Female)



Stomoxys calcitrans (Female)

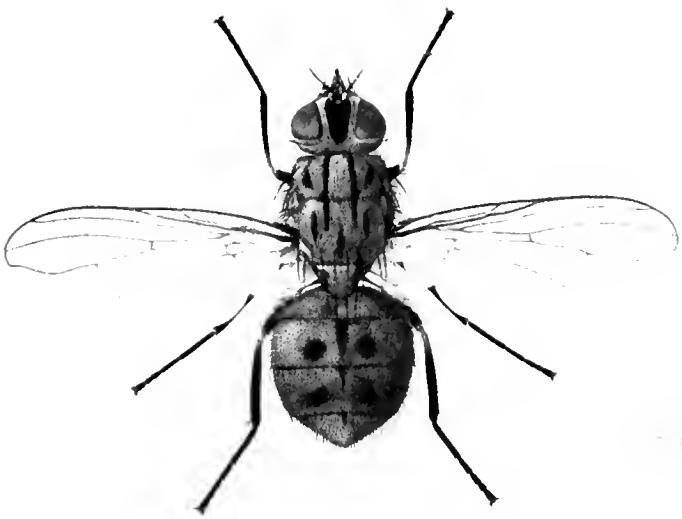
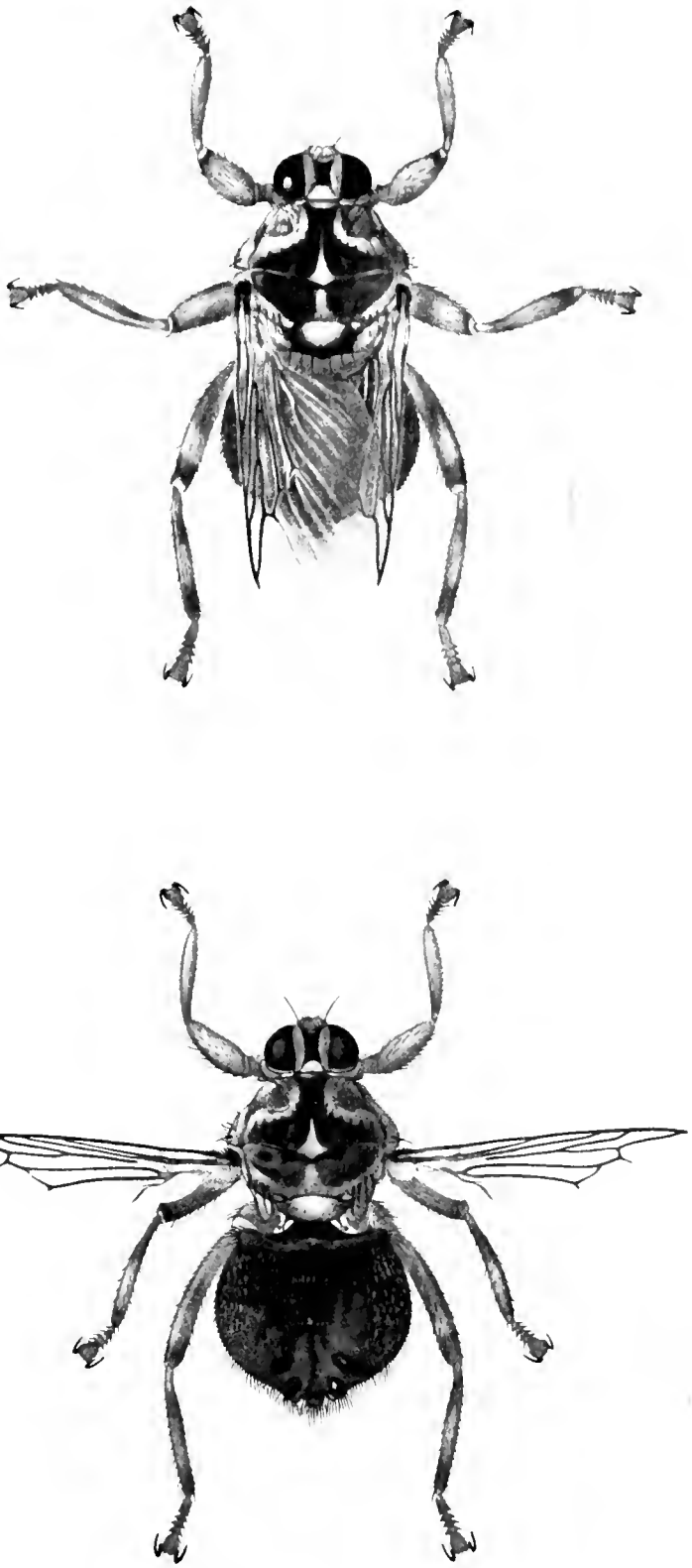


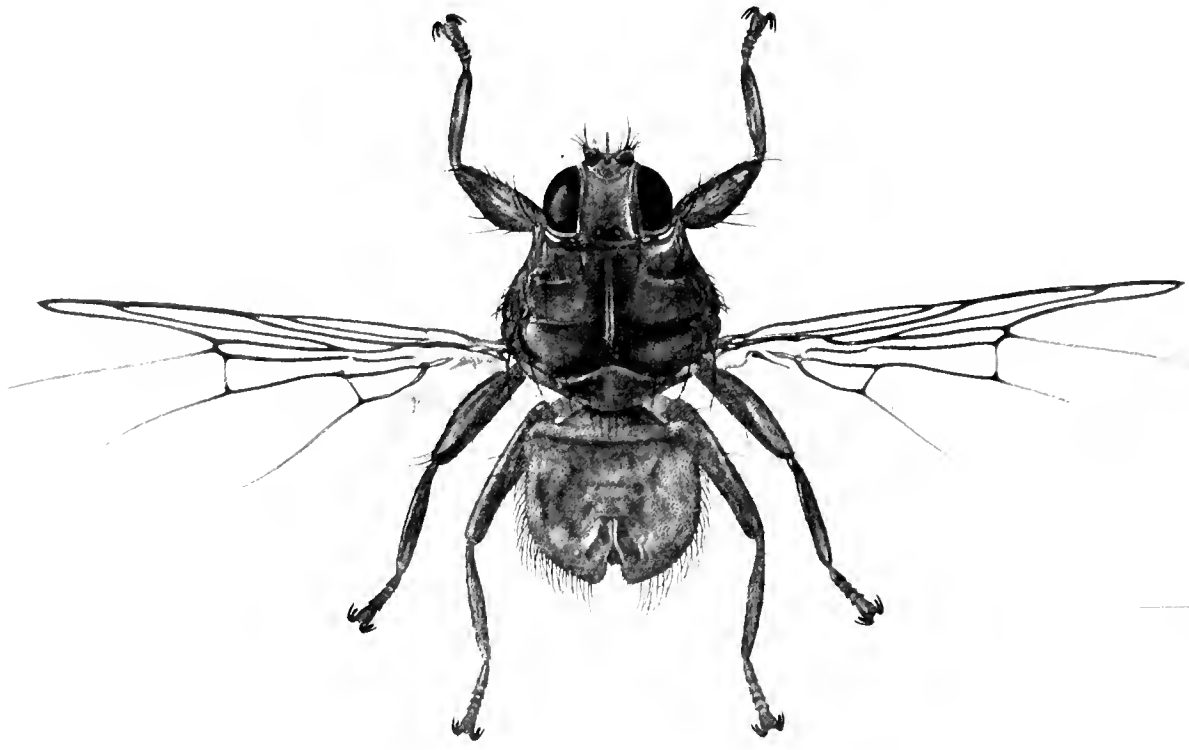
FIG. 1. Haematobia stimulans (Female)

FIG. 2. Lyperosia irritans (Female)



Hippobosca equina (Female)

THE FOREST FLY



Ornithomyia avicularia (Female)

Lipoptena cervi Male

FIG. 1. Lipoptena cervi (Female)

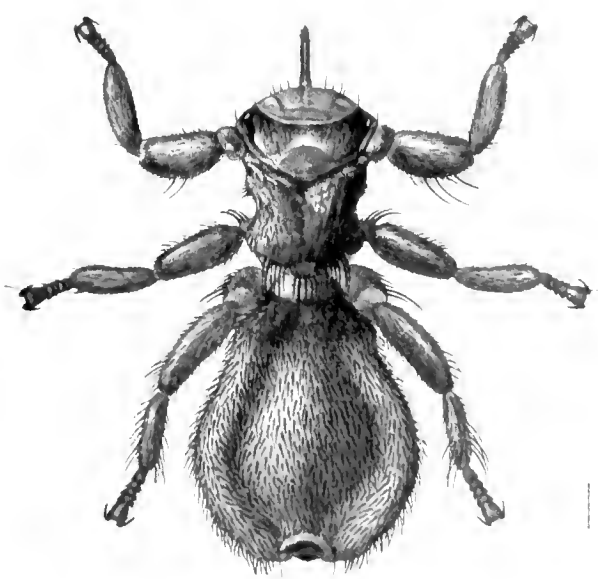


FIG. 2. Melophagus ovinus (Female)

THE SHEEP "TICK," OR KED